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**REGULATORY STRUCTURES AND
BANK –LEVEL RISK MANAGEMENT
IN GHANAIAN BANKS**

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DBA

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**Regulatory Structures
and
Bank –Level Risk Management in Ghanaian Banks**

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ABSTRACT

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Regulatory Structures and Bank-Level Risk Management in Ghanaian Banks

Keywords: Bank Capital Maintenance; Bank Profit Mining; Resolution; Bank Safety; Bank Stability; Financial System; Financial Globalisation; Regulation ; Systemic Risks

This research examines the impact of certain bank-specific variables on bank stability in Ghana, in the context of the existing regulatory structures. The thesis examines this issue along two main themes.

The first part of this study examines whether two of the commonly used measures of banking stability, the CAMELS and the Z-Score, provide similar or different results in assessing the stability of banks in Ghana. The results of this study show that the use of the CAMELS and the Z-score measures could lead to different outcomes in terms of bank stability in Ghana. This suggests that the traditional micro-prudential CAMELS framework should be complemented with the Z-score which inherently has both micro and macro-prudential characteristics of signaling weaknesses in bank stability, and to enhance the management of bank stability.

The second part of the study examines the impact of some bank-specific variables on bank stability. Using the panel data approach, the results show that while bank size, regulatory governance, regulatory independence and origin impact significantly on the stability score, there was no significant impact in terms of interbank borrowing and non-performing loans. Further analysis using the Blinder –Oaxaca decomposition also suggests that foreign banks in Ghana exhibit relatively higher levels of stability compared to local banks.

The policy implications of these findings suggest that the liberalisation of the banking sector should be accompanied by an effective micro- and macro-prudential supervisory regime in order to manage the stability of the constituent banks and the banking sector as a whole.

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LIST OF ABBREVIATIONS

ADB	Agricultural Development Bank
ANOVA	Analysis of Variance
BCPs	Basel Core Principles for Effective Bank Supervision
BOE	Bank of England
BOG	Bank of Ghana
BIS	Bank for International Settlement
CAMEL(S)	Capital Adequacy, Asset quality, Management, Earnings and Liquidity, Sensitivity to Market risk
CAR	Capital Adequacy Ratio
CEO	Chief Executive Officer
CGFS	Committee on the Global Financial System
CRO	Chief Risk Officer
DIF	Deposit Insurance Fund
DIS	Deposit Insurance Scheme
ERM	Enterprise Risk Management
FIDC	Federal Insurance Deposit Corporation
FIT	Financial Investment Trust
FSA	Financial Services Authority
FSB	Financial Stability Board
GCB	Ghana Commercial Bank
GCSCA	Ghana Cooperative Susu Collectors Association
GDP	Gross Domestic Product
GHAMFIN	Ghana Micro Finance Institutions Network
GLS	Generalised Least Squares
GMM	Generalised Method of Moments
HAC	Heteroskedasticity and Autocorrelation
HIPC	Highly Indebted Poor Countries
IAS	International Accounting Standard
IFRS	International Financial Reporting Standard
IMF	International Monetary Fund

MNO	Mobile Network Operators
MoF	Ministry of Finance
MOU	Memorandum of Understanding
MPC	Monetary Policy Committee
NBFIs	Nonbank Financial Institutions
NPLs	Non Performing Loans
OECD	Organization for Economic Co-operation and Development
OMO	Open Market Operation
OTD	Originate –to –Distribute
OTH	Originate –to- Hold
PD	Primary Dealers
RCB	Rural and Community Banks
SB	State –Owned Banks
SEC	Ghana Securities and Exchange Commission
SHV	Shareholder Value
SMEs	Small-and Medium-Sized Enterprises
SSA	Sub –Saharan Africa
SSNIT	Social Security and National Insurance Trust
STV	Stakeholder Value
VaR	Value at Risk

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE THESIS

The Bank of Ghana (BOG) has progressively adopted the regulatory standards and protocols proposed under the international Basel capital standards and the Basel Core Principles for Effective Bank Supervision (BCPs). Compliance with BCPs is expected to promote bank soundness or stability (Barth et al. 2013). However, adequate supervisory measures must be in place to bring about corrective action when there are regulatory violations, or when depositors are threatened in any other way (Haldane 2012a).

Early detection of bank distress enables supervisory authorities to undertake prompt corrective actions (PCAs) designed to minimise the negative externalities and bailout costs due to bank distress. To this aim and from empirical literature Nicholae and Maria-Daciane(2014) show that the CAMELS (which stands for capital adequacy; asset quality; management quality; earnings; liquidity; and sensitivity to market risk) supervisory system is the most popular model being used and adopted by the central banks of many countries.

Comparatively, CAMELS warning system is not used by all the central banks having the aim to supervise (Nicholae and Maria-Daciane 2014). This contrasts that of the developed economies central banks' supervisory system in recent years. Comparatively, the Fed Bank uses the Risk Bank SEER model and the SCOR model for measuring bank performance deterioration. European Union countries, including France use for example, SAABA –an early warning system,

SIGAL –a support system of examinations on site and ORAP – a rating system off-site, while Germany uses the BAKIS system (Nicholae and Maria-Daciane 2014).

Bank supervisors of developed and developing countries like Ghana have developed their own early warning statistical models for the last two decades, which are based on diversely heavy sets of economic and financial variables. In the empirical literature, prediction of bank distress has been primarily focused on the identification of leading indicators that contribute to generate reliable early warning systems (EWS). Such signals may be grouped into two broad categories: market-based measures and accounting-based measures (Chiaramonte et al. 2015). They suggest that, the first group of indicators relies mostly on the market prices of bank equity, bond spreads and credit default spreads to estimate a bank's distance to default.

Empirically, Hagendorff and Kato (2010) used market prices of bank equity to estimate bank distance to default, while Chiaramonte and Casu (2013) used credit default swap(CDS) spread to measure distance to default. Ötke-Robe and Podpiera (2010) had earlier used the CDS spread as a measure of banking stability. Chiaramonte et al.(2015) contend that market –based indicators of bank distress have several advantages. Firstly, they are generally available at high frequency, providing more observations and shorter lags than financial statements data. Secondly, they are forward-looking since they incorporate market participants' expectations. Chiaramonte et al.(2015) argue in support of Čihák (2007) who stated that market indicators are not subject to confidentiality

biases as may be the case for some accounting data, i.e., those reported solely to supervisory authorities.

Currently financial stress indices (FSIs) are widely used by policymakers. The FSI is used as an instrument for monitoring financial stability and even for activation of macro-prudential policies (Višíček et al. 2016). A financial stress index measures the current state of stress in the financial system by combining several indicators of stress ranging from market pressures, external vulnerability, banking system vulnerability and financial markets vulnerability into a single statistic (Višíček et al. 2016).

From policy perspective, reliably predicting increases in financial stress is crucial as it allows policy makers some time to take measures to alleviate stress. Vermeulen et al. (2015) show that spikes in financial stress may appear very abruptly. Empirically, they used a sample of 28 OECD countries and estimated their financial stress index into a single statistic. Their results suggest that even though their FSI is clearly related to the occurrence of crisis, there is only a weak relationship between the FSI and the outset of a banking crisis. They therefore suggested that policy makers should be aware of the limited use of FSIs as early warning indicator. Another limitation is that they do not capture interconnectedness and depend on market prices which make the point to distress uncomfortably short from a policy perspective (Vermeulen et al. 2015).

Višíček et al. (2016) recently examined which variables have predictive power for financial distress in 25 OECD countries. Again they found that the potential

drivers of financial distress differ across countries and may differ as well across episodes. Financial stress, they argued is hard to predict. They further stress that the lack of predictability implies that policy makers need to be equipped with flexible tools to respond quickly to emerging financial stress, since long policy lags may aggravate the financial stress episode and the negative effects on the real economy. Furthermore, the evidence showed that whereas their in-sample -fit of the country model was able to track most of the FSI dynamics, the out-of-sample were far less impressive (Višíček et al. 2016).

Nevertheless, the quality of market prices is conditional to the degree of liquidity and transparency of financial markets where bank stocks, debentures and credit default swap(CDS) are traded. As a matter of fact, the usefulness of market-based indicators is severely affected in case of illiquid and opaque markets. In support of their critique on the use of market –based indicators, the Ghanaian stock market for example, only trades in stocks and it is yet to develop its bond and credit default swap(CDS) market. Its nascent nature also affects its liquidity (Yartey 2006; Ghana Stock Exchange (GSE) 2015). Moreover, since market-based indicators are usually available only for large and listed banks, they can be used just for a relatively small fraction of banks, especially in Ghana.

Chiaramonte et al. (2015) contend that the second group of indicators of bank distress probability is dependent on financial and accounting values. Accounting data form the basis for assessing the vulnerability of banks from the perspectives of regulators (Schwartz et al. 2014). The simplest are accounting ratios derived from bank accounting information. Two commonly used indicators are the loan-loss provision and loan –loss reserves ratios as higher

levels can indicate greater bank risk (Casu et al. 2015: 663). According to Casu et al. (2015) the ratios are considered indicators of credit risk, which partly reflect the quality of the loan portfolio, since variations in provisioning across banks may reflect different internal policies regarding loan classification, reserve requirements and write-off policies. As such researchers have sought to use a broader indicator of bank risk, namely, insolvency risk as measured using the Z-score indicator (Casu et al. 2015). Empirically, Poghosyan and Čihák (2011) cited in Chiaramonte et al. (2015:113) suggest that there is general agreement in banking literature that support the ability of CAMELS variables to assess banks in terms of their financial vulnerability and to predict bank distress. The recent work on the use of CAMELS as a tool to assess banking stability in Brazil by Marques Periera and Saito (2015) resulted in outcomes which support the general empirical view on the relevance of the CAMELS in assessing banking system vulnerability.

In recent studies, some efforts have been devoted to complement the CAMELS variables with book-based indicators, such as the Z-score (Klomp and De Haan 2012; Mergaerts and Vannet 2016). The Z-score is a bank specific indicator of distance to default from insolvency that combines profitability, capitalisation and the standard deviation (volatility) of profits (Casu et al. 2015: 724). Casu et al.(2015) further indicate that the Z–score depends positively on both profits and capital ratio and negatively on profit variability, so a higher (lower) Z-score indicates that the bank is more (less) stable or the less(more) likely it is that the bank will fail.

The empirical attractiveness of Z-score of banks is the fact that it does not require strong assumptions about the distribution of returns on assets (Strobel 2011). This represents an interesting advantage of Z-score, especially from a practitioner's point of view (Ivičić et al. 2008). Contrary to market-based risk measures, which are quantifiable only for listed financial institutions, the Z-score can be computed for an extensive number of unlisted as well as listed banks. The Z-score also has flexibility and allows for the evaluation of various bank variables either as endogenous in evaluating business strategies and potential herding or exogenous in systemic assessment (Köhler 2015). Hesse and Čihák (2007) argue that the Z-score is an objective measure, as all banks face the same risk of insolvency in case they run out of capital and therefore its methodology is non-discriminatory. The Z-score further allows the researcher to compare the risk of default in different groups of institutions, which may differ in their firm characteristics, but face the risk of insolvency (Čihák et al. 2012).

Despite its advantages, the Z-score is not immune from some caveats. Firstly, as for the other accounting-based measures, its reliability depends on the quality of underlying accounting and auditing framework, which is a serious concern in less-developed countries (Chiaramonte et al. 2015). Secondly, as pointed out by Čihák (2007), the Z-score, as well as other market-based measures like the distance-to-default look at each bank separately, potentially overlooking the risk that a distress in one financial institution may cause a loss to other financial institutions in the system. Thirdly, Casu et al (2015) argue that the Z-score is a static and backward –looking measure at a point in time. They stress that even if it accurately reflects portfolio quality and risk, managers are

likely to have timing discretion over it, which may be exercised in a manner that will minimise regulatory costs. The few available results on the predictive power of Z-score are mixed. Poghosyan and Čihák (2011) suggest that when the Z-score is added to the baseline predicting model, the coefficient in front of the Z-score variable is insignificant, suggesting that the Z-score scarcely contributes to predict bank distress.

On the contrary, Vazquez and Federico (2015) who examined a bank-level dataset that covers about 11,000 U.S. and European banks from 2001 through 2009 found that the probability of failure seems to be relatively more influenced by bank risk profiles, particularly as reflected in the pre-crisis Z-score, and by bank operating environments. Again, Lepetit and Strobel (2015) compare different existing approaches to the construction of Z-score measures, using a panel of banks from 15 EU countries, USA and OECD countries covering the period 1998–2012. Their results indicate that the log of the Z-score emerges as an attractive and unproblematic insolvency risk measure to use (even as a dependent variable in standard regression analysis), giving now more rigorously founded support to its emerging use in the literature.

A recent study also by Chiaramonte et al.(2015) using probit and complementary log–log models, finds that specifications that use the natural logarithm of the Z-score show a good predictive power for identifying banks in distress. In particular, their key results indicate that the Z-score performs as well as CAMELS variables, but it has the advantage to be more parsimonious than CAMELS Models, because it demands less accounting and questionable data (i.e., the covariates to be used in CAMELS related analyses).

Such a result, they argue, is extremely valuable for those stakeholders (i.e., investors, depositors, financial analysts, etc.) who rely solely on public available information and look for simple and trustable measures of bank soundness (Chiaramonte et al. 2015). Again, they find that the predictive ability of the Z-score holds even, using a different computational approach which takes into account the average of returns on assets over a three year period. In assessing the predict power of the Z-score according to different bank characteristics, they further find that the Z-score is slightly more effective when the organisational and productive complexity of banks increase along with public incentives to scrutinise bank riskiness, as it is the case for large banks (Chiaramonte et al. 2015).

The thesis therefore investigates bank stability using the accounting –based supervisory risk assessment tools. It makes use of the two accounting –based principal methods of CAMELS Model and the Z-score to ascertain the level of bank stability in Ghana. It also examines the relationship between the regulatory structures and bank–level risk activities and bank stability in Ghana. It is therefore useful to introduce a definition of financial system stability.

1.2 FINANCIAL SYSTEM STABILITY

The financial system of a country according to Cecchetti and Schoenholtz(2015) has six parts each of which plays a fundamental role in the country's economy. Those parts are money, financial instruments, financial markets, financial institutions, government regulatory institutions and central banks. Casu et al.

(2015: 162) suggest in broad terms that financial stability entails maintaining an efficient flow of funds within the economy and confidence in the financial intermediaries.

1.2.1 Banking Stability

Banking stability is traditionally assumed if bank failures are absent (Schaeck et al. 2009). A bank is considered insolvent when its liabilities exceed its assets and its net worth becomes negative. A bank is deemed to have failed if it is liquidated, merged with a healthy bank under government supervision or pressure or rescued with state financial support (Casu et al. 2015: 227).

Monnin and Jokipii (2010) further point to a state of banking stability to include “normal” reductions in banking sector stability – i.e. a level of instability that can regularly be observed but that does not translate into a banking crisis.

According to Schinasi (2004) a financial system is said to be entering a range of instability whenever it is threatening to impede the performance of the economy and is in a range of instability when it is impeding performance and threatening to continue to do so.

1.3 FINANCIAL CRISES AND TYPES

Casu et al. (2015) define a financial crisis broadly to include features of financial fragility, bank panics and contagion, when financial markets experience volatility and financial firms suffer illiquidity and insolvency. Reinhart and Rogoff (2009) distinguished two types of crisis: (i) currency and sudden stop crisis; and (ii) debt and banking crisis.

However, this classification is not necessarily exclusive since some crises are “twin crises” when currency depreciation exacerbates the banking sector problems through banks’ exposure to foreign currency or “triplet crises” where there is a simultaneous occurrence of three or more crises (Casu et al. 2015). A currency crisis occurs when the value of a country’s currency depreciates substantially in a short period of time (Kim et al. 2013). A sudden stop or a capital account or balance of payments crisis can be defined as a sudden (and often large) decrease in international capital inflows or a sharp reversal in aggregate capital flows to a country, likely taking place in conjunction with a sharp rise in its credit spreads (Casu et al. 2015).

A debt crisis occurs when a country defaults on its sovereign debts. A debt crisis is identified by the presence of a debt rescheduling agreement or negotiation, arrears (amount past due and unpaid) on principal repayments or interest payments, and an International Monetary Fund (IMF) debt rescheduling loan agreement (Allen and Carletti 2010).

1.3.1 Banking Crisis and Systemic Banking Crisis

When the default or failure of a bank brings about a loss of confidence in the banking systems that leads to a run on banks as individuals and companies withdraw their deposits, authorities are faced with a banking crisis (Casu et al. 2015). A banking crisis is identified by specific events such as bank runs on retail and wholesale deposits, credit crunch externalities, mergers, takeovers and government interventions (BOE 2009), or by quantitative thresholds such as the ratio of non-performing assets to total assets exceeding 10% or the cost

of rescue operations being more than 2% of GDP (Demirgüç, -Kunt and Detragiache 2005). However banking crisis becomes 'systemic' when the ratio of non-performing assets to total assets exceeds 20%, in addition to bank closures of at least 20% of banking system assets or the fiscal restructuring costs of the banking sector is more than 5% of GDP (Casu et al. 2015:248).

These concepts will guide our interpretation of the level of stability of Ghanaian banks in this research and the supervisory tools that can be deployed by the regulator to monitor bank risk taking as well as vulnerabilities in the financial system.

1.4 CONTEXT OF THE STUDY

This study focuses on the banking sector in Ghana, which is a very important component of the country's financial system. Banks are at the heart of the financial system in Ghana. Banking is a highly regulated industry and the use of the word 'bank' is technically determined by law (Cranston 2002).

The liberalisation of the Ghanaian banking sector has led to the influx of foreign-based banks from both developed and developing economies, notably the UK, Nigeria, Togo, Libya and India among others. However, the regulatory and risk governance frameworks of their parent institutions vary, from a high rigour regulatory regime (UK and India and South African banks) through medium to a low rigour regulatory regime (West African and Libyan banks respectively) (De Mendonça et al. 2010).

The degree of regulatory rigour is measured by a country's level of implementation of International Financial Reporting Standards (IFRS), the Basel (II and III) and the compliance with the BCPs (Enoch et al. 2015). Although an earlier empirical study about the relationship between the BCP and bank soundness has been found to be insignificant (Demirgüç-Kunt and Detragiache 2011), a recent study using the global BCP and stability index analysis by Barth et al.(2013) empirically shows that many countries including Nigeria though have not fully implemented all the key features of the BCPs but have strengthened the degree of their regulatory rigour and capital regulation stringency are marginally, and positively associated with bank efficiency.

A further empirical evidence from Enoch et al.(2015) shows that Nigeria classified as having a medium level regulatory rigour has implemented 50-80% of the BCPs, a deposit insurance scheme, adopted the IFRS and has a 90 day asset classification policy. This contrasts with South Africa which is classified as high, has completed the Basel II and is currently implementing Basel III, over 80% of the BCPs, and has a 90 –day asset classification policy as a regulatory measure (Enoch et al 2015). India like the UK is currently implementing the Basel III (Reserve Bank of India 2014). The UK regulatory system classified as high rigour is currently implementing Basel III, has a deposit insurance scheme, a strong accounting and corporate reporting culture and history (King 2013). Togo, Libya and Ghana as countries that have not implemented the Basel II can be described as low rigour in their regulatory posture.

Ghana, though has adopted the IFRS since 2009, has implemented less than 50% of the BCPs, has no deposit insurance but enforces a 90-day asset

classification policy (Enoch et al. 2015). Against this background is the absence of an explicitly defined safety and resolution system should there be bank failures (IMF 2013a). Such situations provide many challenges to regulatory design and effectiveness (Nier 2009).

The increased presence of foreign banks in Ghana raises issues on whether they should be regulated on the current Basel II and III standards or continue to face the potential risk of regulatory dialectic (Casu et al. 2015:205) from a bank originating from a high or medium rigour regulatory regime or country. The expected benchmark, the Basel II and III requirements are therefore critically examined below.

1.5 THE BASEL CAPITAL REGULATIONS AND STABILITY: BASEL II AND III

Bank regulation is concerned primarily with ensuring that banks are financially sound and well managed (Chaudhry et al 2015). The current international capital regulations the Basel III, proposed by the Basel Committee has evolved from Basel I and Basel II. Under the 1988-Basel I bank capital regulation, the capital required to fund a loan portfolio is a minimum 8% of assets, whatever the riskiness of bank loans or the degree of credit risk diversification (Dermine 2015). The aim of Basel III is to increase the ratio of total capital ratio – from 8% to 10.5% in 2019 – and to increase the Tier 1 capital ratio (now called Core Tier 1 ratio) – from 4.5% to 6% in 2019 – in order to strengthen the capital requirement in Basel II (Dermine 2015).

Beyond capital requirement strengthening, liquidity ratios, countercyclical capital buffer, systemic surcharges and a raw leverage ratio will be introduced progressively. Consequently, the main goal of Basel III compared to Basel II is that: (i) it strengthens the micro-prudential regulation that existed in Basel II; and (ii) it introduces macro-prudential regulation to avoid systemic crisis (Nyantakyi and Sy 2015).

Goodwill and deferred tax assets are to be deducted in the calculation of common equity Tier 1 Capital. Hybrid capital instruments with an incentive to redeem through features such as step-up clauses, which, under Basel II counted towards Tier 2 Capital and up to 15% of the Tier 1 Capital base, will no longer be eligible as capital. Under Basel III only dated subordinated debt will be deemed Tier 2 Capital. There is an additional Global Systemically Important Bank (G-SIIB) Surcharge consisting of tangible common equity of 1-2.5%. This makes the minimum total capital, plus conservation buffer, countercyclical buffer, and G-SIIB charge total between 11.5% and 15.5% (Dagher et al. 2016)

The Basel II risk-based capital regulation, adopted in June 2004, applies a formula that captures better credit risk (Basel Committee 2004). The framework includes three pillars: capital regulation, bank supervisors' oversight and information disclosure. Pillar 1 capital regulation requires bank capital to cover annual credit losses with a 99.9% confidence level. The degree of credit risk diversification is assessed under Pillar 2 by bank supervisors who can adjust the capital adequacy requirement (Dermine 2015).

The Pillar 2 process is therefore essentially the second phase of Basel II and involves an assessment of the additional capital that is required to mitigate those risks that are not adequately covered by Pillar 1. The process is itself a two-tier one that involves a bank carrying out an internal assessment and the regulator reviewing and evaluating this. In effect, the adequacy of a firm's capital needs to be assessed both by the bank and the banking regulator (Basel Committee 2004).

This therefore involves: (1) an internal capital adequacy assessment process (ICAAP), which the firm will be required to carry out; and (2) a supervisory review and evaluation process (SREP), which will be conducted by the banking regulator as part of its risk assessment of the bank. Although the Basel II capital regulation also covers market and operational risks, the essence of Basel II internal-rating based (IRB) approach was retained in the revised Basel III capital regulation (BCBS 2014a).

However, Pillar 1 risk-weighted Basel II/III capital ratio has been criticised for several reasons: insufficient capital in a recession, complexity, open to gaming (Haldane 2012b), lack of robustness, and fear of excess leverage in the economy (Dermine 2015). During the financial crisis, it was also observed that highly leveraged banks that experienced failure or distress were still showing strong risk-based capital ratios (BCBS 2014c).

Protagonists of the simple non-risk-based capital requirement, the leverage ratio (LR) argue that it can potentially alleviate issues surrounding model risk in the calculation of risk-weights or even the outright manipulation of risk-weights

(Jarrow 2013). The leverage ratio hinders excessive on-balance sheet and off-balance sheet leverage by limiting a bank's total assets (including off-balance sheet) in relation to its equity since it is not based on risk-adjusted assets.

Indeed, the crisis has shown that there can be circumstances under which sophisticated concepts for risk measurement fail and there are also indications of deliberate optimisation of risk-weighted assets by banks ("gaming") (Grill et al. 2015; Dermine 2015). Dermine (2015) further argues that its *raison d'être* has been the need to limit the probability of a bank run when there is imperfect information on the value of bank assets. That is, it also provides a simple and transparent back-stop to safeguard against model and measurement error in risk based capital requirements (European Systemic Risk Board 2015).

Grill et al. (2015: 123) suggest various reasons why a leverage ratio (LR) requirement may be beneficial. Most importantly, highly leveraged banks have a lower loss-absorbing capacity and are arguably less resilient to shocks. This is of particular concern if the build-up of excessive leverage concerns the entire banking sector, as witnessed in the run-up to the financial crisis. By capping the total amount of leverage banks can achieve, a leverage ratio (LR) requirement ensures that banks with a large share of low risk-weighted assets hold additional loss-absorbing capacity. The LR may therefore present a better measure for containing aggregate risk and reduce the fragility of the financing structures where risk weights are mis-specified or risks are otherwise not captured. LR addresses the potential risk of unsustainable growth of leverage in a way that risk-weighted floors do not (Basel Committee on Banking Supervision 2014b: 4-5).

Notwithstanding these potential benefits, the LR has been criticised by market participants and other stakeholders. For example, the Parliamentary Commission on Banking Standards (PCBS 2013) report argues that the proposed Basel-III capital leverage ratio of 3 per cent is too low or 33.3 times leverage multiplier is too high, and that it should be substantially higher than this level.

Admati and Hellwig (2013) favour an equity ratio of 30% or more and argue that it will not reduce the lending capacity of banks; rather, it will increase it because banks will become less risky and able to raise equity more cheaply from the capital market. Because the leverage ratio is implemented on a gross and non-weighted basis, it might encourage banks to increase their exposure to high-risk, high return lending and could potentially increase their risk exposures and lending to SMEs.

While these concerns are generally valid, they need to be assessed in the context of the overall prudential framework (rather than in isolation): increased risk-taking should raise banks' risk-weighted assets, provided that the risk weights are properly determined, so that at some point the risk-weighted capital framework becomes binding again. Hence, the potential for a marginal increase in risk-taking owing to an LR requirement should be limited as long as both approaches to capital regulation are mutually reinforcing (Grill et al. 2015). The above discussion therefore suggests that a trade-off from imposing a leverage ratio (LR) requirement should exist, even when abstracting from model risk and risk-weight manipulations. On the one hand, it should enhance banks'

loss-absorbing capacity and their resilience; on the other hand, there is a potential incentive to increase risk (Kiema and Jokivuolle 2014).

In terms of Basel III and banking stability, Grill et al. (2015) using a simple theoretical model, in the spirit of Dell’Ariccia et al. (2014) and empirical data show that the increased incentive to take risk is more than outweighed by the increase in loss-absorbing capacity from higher capital, thus leading to more stable banks. These results are confirmed within an empirical analysis on a large sample of EU banks. Their empirical estimates suggest that banks bound by the LR increase their risk-weighted assets to total assets ratio by around 1.5-2 percentage points more than they otherwise would, i.e. without the LR requirement. Importantly, this small increase in risk-taking is more than compensated for by the substantial increase in capital positions for highly leveraged banks, which results in significantly lower estimated distress probabilities for banks bound by the LR.

1.5.1 CRITICAL REVIEW OF BASEL II AND III IN THE GHANAIAN CONTEXT

Basel III outlines various measures to raise the quality, consistency, and transparency of the regulatory capital base, focusing largely on the definition of Tier 1 capital. In Ghana, the capital structure of banks and its complexity are largely a straight forward composition of common shares and retained earnings and thus already fulfil Basel III quality requirements (Fuchs et al. 2013).

Secondly, the leverage ratio may offer an important safeguard in Ghana where regulatory capacity to ensure effective spotty risk assessment and modelling capacity introduced into risk capital calculations is gradually being upgraded (Fuchs et al. 2013).

For a developing country like Ghana, Nyantakyi and Sy (2015) argue that some probable flaws in applying the Basel in the developing countries relate to moral hazard and too big to fail (TBTF) institutions due to local influence of banks. Their suggestions reinforce Honohan and Beck (2007) empirical studies on the crises in sub-Saharan Africa which show that the crises on the continent were caused by governance related problems both in the banks and the regulatory systems.

The implementation of international capital standards in Ghana and in other sub-Saharan countries have also been critiqued by Fuchs et al.(2013) who studied the financial regulation in Africa. They suggest that the overall level of capital is still relatively high but regulators are confronted with a more delicate art of managing banking stability. Regulators have to deal with capital levels on the one hand, against the historically high macroeconomic volatility which makes increased levels of capital and liquidity a necessity on the other. And without investments in supervisory capacity, capital provides the only stability anchor. Even though Ghana for example is yet to implement the Basel II and Basel III subsequently, the main criticism of the Basel II and III, in the African context is that it does not trade-off between the two stability anchors- capital and capacity-but it does contain elements that increase demands on capital and supervisory capacity at the same time (Fuchs et al. 2013).

Even with said high capital proposed by Fuchs et al.(2013), their capital requirement argument can further be critiqued as being nominal in measurement, and not in real terms. Real capital levels are therefore low which

also limits their effectiveness on financing large and long term projects to transform the Ghanaian economy. Therefore, their argument that further capital increases are likely to have little impact on stability, especially compared with the much higher expected benefits of investing in supervisory capacity is not in sync with the developmental role expected of the banks.

Another critique is to consider the initial level of capital at which banks are being requested to increase their capital. Current capital levels of Ghanaian banks are too low compared regionally and internationally. For example, using an average exchange rate of ₦197: 1 USD in early 2016 (Bank of Nigeria 2016) the minimum paid up capital of banks licensed in Nigeria is ₦25billion (Ikpefan 2012) is equivalent to \$127 million. Compared to banks licensed by the Ghanaian regulator, which is currently around \$32 m using an average exchange rate of 3.8 GHS:1 USD in 2016(Bank of Ghana 2016). The minimum paid up capital of a licensed Ghanaian bank is about a quarter of a Nigerian bank licensed by the Bank of Nigeria.

The earlier critique is reinforced by the need to develop a countercyclical capital buffer regime under Basel III. Fuchs et al. (2013: 167) further argue that the focus of the proposed measure is on the deviations of private sector credit as a percentage of Gross Domestic Product (GDP) and not on absolute private sector credit growth. This again is problematic. They empirically cite the Ghanaian case where credit to GDP has more than tripled in a decade, with nominal credit growth frequently rising above 30%, but the ratio of credit to GDP has remained below the trend level in the years before the crisis. The high trend momentum they argue, was caused by a fast growth from a low base of

credit to GDP, and would be more challenging to authorities to determine the buffers.

Therefore in Ghana as in other developing countries in general, buffers need to be triggered by also looking at nominal private sector growth. In Ghana where the conduct of risk-based supervision is in its nascent stage, it is unclear how the Bank of Ghana would institute a regime that goes even further than to exert judgment, as well as communicate and enforce decisions (Fuchs et al.2013: 168).

The issue of Basel II and III capital regulations, coupled with the influx of foreign banks in Ghana extend into the research motivation and problems which follow this section.

1.6.0 MOTIVATION AND RESEARCH PROBLEMS

This thesis is motivated by the following reasons. First, in theory, financial liberalisation is expected to improve financial sector infrastructure in five broad ways namely: competition with efficiency gains through provision of fresh funds; transparency through compliance with the financial reporting standards; greater degree of integration into international financial markets; improved corporate governance; and potential completeness of both local and global markets (Schmukler 2008). The liberalisation of the Ghanaian banking sector was in line with this view of participating in financial globalisation.

Following the lead of existing literature, notably Casu et al. (2015: 583), it is expected that foreign banks would contribute to greater efficiency and resilience

of the financial sector, both because foreign presence implies greater borrowing in local currency (thereby minimising currency mismatches) and because foreign banks can help emerging economies recapitalise their banking systems.

Another interesting argument is that if foreign banks dominate the banking sector, governments are less likely to bail out banks when they have solvency problems. The lower likelihood of bail-outs therefore encourages more prudent behaviour by banking institutions, increases discipline and reduces moral hazard (Claessens and Van Horen 2012). Furthermore, foreign banks may also help to enhance financial stability by enabling greater lending diversification and by improving risk management practices (Casu et al. 2015).

In spite of its benefits, liberalisation of the financial sector also carries some risks. Opening a weak domestic financial sector to large capital movements is potentially risky, if the domestic financial sector does not manage risk properly, does not have sufficient reserves and capital and, does not have the right incentives, large capital inflows and outflows can create severe problems in the domestic financial sector (Schmukler 2008). This argument is reinforced by the banking crises in Argentina, Chile, Mexico and Turkey in the 1980s and 1990s which have been attributed to these factors (Čihák and Schaeck 2010). It is therefore imperative that liberalisation of the banking sector in Ghana is accompanied by a strong and effective micro- and macro-prudential regulatory and supervisory regime.

Another argument is that the entry of foreign banks requires that the business environment is stable in terms of exchange rate, inflation and controlled fiscal policy to assure investors that the value of their investment is protected (Moyo

et al. 2014). This period of study is however characterised by increased depreciation of the cedi, excess public sector borrowing and rising inflation.

Remarkably, the annual reports of banks indicate that banks have continued to perform well. These are confirmed by the Bank of Ghana stability reports using the CAMELS variables. Non-performing loans (NPLs) to total gross loans in the Ghanaian banking sector was 16.2% in 2009, 17.6% in 2010, 14.1% in 2011, 13.2% in 2012 and 12.0 in 2013 (Bank of Ghana, 2014:10). The NPLs to total credit ratios reported by the banks in Ghana have persistently stayed between the crisis (Demirgüç-Kunt and Detragiache 2005) and systemic crisis (Casu et al. 2015) thresholds since 2009. This conflicting situation suggests that the CAMELS framework might not be adequate in capturing the risks inherent in the banking system.

Further reports from the International Monetary Fund (IMF) show that there exists the motivation for banks to practically underestimate their NPLs in order to shore up their capital (IMF 2011, 2013a). These arguments are reinforced by Beck et al.(2011) who show that in Ghana, systemic distress is concentrated in state-owned banks and a number of small, locally owned banks that face liquidity problems because of their dependence on the public sector and wholesale funding. One of the motivations for this research therefore follows from the seemingly conflicting results from the Bank of Ghana financial stability reports and other measures of financial stability.

Again, the influx of foreign banks into the Ghanaian banking sector whilst bringing real benefits may also pose challenges to the stability of the Ghanaian

banking sector. In theory, due to the diversification benefits enjoyed by foreign banks they face lower likelihood of defaults and hence should have a positive effect on the stability of the host country's banking system. However, foreign banks could also become conduit for contagion, transmission of shocks from their home country to the host country, and thus negatively affecting the stability of the host country's banking system (Casu et al. 2015: 584)

This is particularly important if the parent company of the foreign bank can take decisions that are good for the parent but bad for the subsidiary in the host country. If this were the case, it can lead to instability in the foreign bank in Ghana as in the cases of the failures of Ghanaian subsidiaries of Bank for Credit and Commerce (BCCI) and Meridian BIAO in 1991 and 1995 respectively that resulted from the large foreign exposures to their parent banks (Brownbridge and Gockel 1995). It is noted that, countries with advanced levels of legal regulation and capital adequacy implementation in their banking systems are more likely to have lower levels of country risk (Kim et al. 2013).

Again Casu et al.(2015) point out that, a large foreign banking presence can reduce information available to host country's supervisors. The implication is that, the level of regulatory rigour and risk governance practices of the parent company of a foreign bank operating in Ghana can be an important determinant of its stability. The research therefore is motivated by the desire to evaluate whether the influx of foreign banks is promoting or undermining banking stability.

1.7.0 RESEARCH AIMS AND OBJECTIVES

The research principally aims to investigate the stability of Ghanaian banks using the Z-score as an alternative measure of bank stability against the current CAMELS variables. As discussed under section 1.1 in this chapter, where the empirical evidence to support the comparative validity of the CAMELS and Z-score for identifying banks in distress was examined, Beck et al.(2013) document that the Z-score remains as one of the main measures of bank stability and bank risk-taking.

Given the varying levels of regulatory rigour and risk governance practices of the parent companies of the foreign banks operating in Ghana, this study also examines whether there are any differences in the stability of foreign banks operating in Ghana when compared to that of local banks. The study explores further whether the origin of a foreign bank operating in Ghana influences its stability. Bank size, asset quality, the level of interbank borrowing and external borrowing represent bank –level variables or bank-level risk taking activities (Krause and Giansante 2012; De Johghe et al. 2015). Likewise, risk governance and the regulatory independence of banks are regulatory variables that do affect bank stability (Doumpos et al. 2015).

The third objective therefore is to examine the relationship between the regulatory and bank-level risk taking variables and bank stability in Ghana. Such insights will help policy makers to assess the trade-offs in policy options that will promote increased stability of the banking sector and their possible effectiveness in Ghana.

1.8.0 RESEARCH QUESTIONS

The research objectives lead to the following research questions:

1. What is the overall level and nature of bank stability of licensed banks in Ghana? The research will empirically examine the level of stability of all the sample banks using the two stability measures to ascertain if they report the same level and pattern of stability.

The nature of stability will involve considerations as to how the level of stability in the foreign banks differ or are similar to that of the local banks and their level of significance on bank stability in Ghana . The question is similar to some of the themes undertaken in empirical studies by Mulyaningsih et al. (2015) in Indonesia; Lee and Hsieh (2014) in Asia and Claessens and Van Horen (2012) globally. Again the pre-capitalisation period from 2009 to 2011 will also be compared to 2012 and 2013 stability scores to ascertain the impact of parity in capitalisation on the stability levels using both measures.

2. How do the current regulatory design and bank-level risk management practices impact on bank stability in Ghana? Given the multidimensional nature of regulatory design challenges, Nier (2009) argues that it is likely that no single structure will be optimal for all countries, regardless of the state of development of the financial sector and other contextual circumstances.

An effective regulatory design in the Ghanaian context, should take into account how banks have effectively complied with risk governance

standards required by the Bank of Ghana and BCP 21 which requires disclosure of information to ascertain the state of financial information and also as envisaged in the International Financial Reporting Standards for financial disclosures (IFRS7); financial assets measurement (IFRS 9); and for fair valuation of assets and liabilities (IFRS 13).

In addition, the regulatory independence of banks from the central bank and government influence through shareholding or control in relation to the ability of the central bank to take corrective action when banks fail to meet prudential regulation as required under BCP 22 (Doumpos et al. 2015) is examined. Again, the effect of licensing which allows for the entry of banks with varied origin will be assessed as required under chapter 2 of the BCP. These regulatory measures guide the licensed banks on their day-to-day activities and risk taking (Agoraki et al. 2011).

Bank level risk management considers risk-taking activities which manifest in their size either absolute or systemic (Berger and Bouwman 2013; Chaudron and De Haan 2014), non-performing loans (Ghosh 2015; Casu et al. 2015) and funding requirements that lead to interbank –borrowing and debt as against the use of stable deposits and core deposits (Hahm et al. 2012).

1.9.0 BANK REGULATORY STRUCTURES AND BANK –LEVEL RISK TAKING: THE ISSUES

Experiences in the United Kingdom and the United States show that the tax payer had to underwrite most of the bank failures which is synonymous with state ownership failures (Molyneux et al. 2014). The impact had been minimised due to the existence of a safety net and preparedness such as the existence of deposit insurance, adequate resolution options, procedures and contingency plans for information and coordination of activities. There were also procedures for communication across different but responsible authorities at home and abroad (BOE 2009; Giese et al. 2013).

The current Ghanaian regulatory structure lacks these institutions creating an implied or tacit impression that the existing risk management systems in banks should be able to signal banking sector weaknesses to assist in proactive and intrusive regulation of banks at the firm level. In other words, there is the expectation by the Ghanaian regulatory authorities that, the routine bank examination carried out by the banking supervision, prudential returns, capital adequacy regulation applied in a less complex though a growing banking system can be relied on as adequate to stem potential bank failures and needed signals for proactive regulatory action (IMF 2011, 2013a).

Another characteristic of the Ghanaian regulatory structure is the paucity of data for meaningful quantification of some of the emerging key macro risk assessment variables. This situation has inevitably led to limited research and insight into the current risk management practices of individual banks that may

have serious and or potential systemic effects. The bank-level risk management steps taken by individual banks are currently evidenced by their annual reports, central bank supervision, site visits and use of legal mandates (IMF 2011).

Besides both state-owned and foreign-owned banks have experienced a high degree of non-performing loans. NPLs erode the capital base, increase vulnerability to liquidity strains and reduce capacity of banks to withstand financial shocks. The high non-performing loans also raise the question about the stability of Ghana's banking sector and how it could be made more stable through regulatory measures.

Empirical studies on countries bank stability using the Z-score had focused on developed and middle income economies (Altunbas et al. 2011; Demirgüç-Kunt and Huizinga 2010). However, recent work on banks stability by Klomp and De Haan (2012), had involved the use of both CAMELS variables and the Z-score to assess the impact of bank regulation and supervision on banking risks in developing countries.

The gap in the literature has been that, the recent work by Chiaramonte et al.(2015), had focused on the comparative assessment of the Z-score and the CAMELS using the European case. Second, cross-country studies on bank stability which included Ghana for example by Cubillas and González(2014), Claessens and Von Horen(2012) used only 12 and 14 Ghanaian banks in their samples respectively, while Klomp and De Haan (2012) had included 4 banks that have assets above \$500million. Again the data had focussed on the pre-

crisis period. Therefore, the current work is to fill the gap of exclusion bias due to the threshold used to select the samples set, increase the sample size and increase the currency of the data in assessing the stability of Ghanaian banks.

Again, prior work by Honohan and Beck (2007) and Beck et al. (2011) on banking stability in sub-Saharan Africa which included Ghana examined the effects of the Ghanaian banking sector characteristics by pointing to individual characteristics of the selected components of the CAMEL but did not establish the composite CAMELS or use the two stability measures comparatively in their studies.

The recent literature on bank sector by Adusei (2015) who used return on assets(ROA) and return on equity(ROE) as proxies for bank stability, had focussed on rural banks which account for 5.1 per cent of banking assets in Ghana (IMF 2013a) and not on commercial banks, the focus of this research.

Earlier Alhassan et al. (2014) also examined bank stability in Ghana by using asset quality as a proxy for bank risk-taking but looked at the drivers of assets quality to determine their relationships. Again the literature on governance a key plank of banking regulation and bank stability in Ghana is scarce with the few by Bopkin (2013) and Adusei (2012), had focused on the instruments of governance (boards and their sizes, structure and chief executive officers (CEOs) tenure) and firms performance and efficiency including some listed banks but excluded most of the Ghanaian banks used in this research. Using banking data from 2009 to 2013, this research examines both bank stability

matrices and in particular the relationship between the Z-score and bank-level risk taking and bank regulation variables in Ghana.

1.10.0 METHODOLOGY

This study employs quantitative data collection and data analysis procedures to deal with different aspects of the research problems. Out of a population of 27 licensed universal banks in Ghana, a sample of 20 is studied because seven banks do not satisfy either the minimum of five years in existence with audited financial statements or unavailable data items due to non-disclosure. The share of the excluded banks to total assets of the industry is also insignificant as shown in chapter 2.

The period of study was chosen as it coincided with the period immediately after the global financial crisis and the simultaneous reaction by the Ghanaian regulatory authorities in 2009 to introduce a new capital regulation that required that all universal banks to increase their equity capital from GH¢20million to GH¢60 million or its dollar equivalent of \$60 million. In 2009, one new Ghana cedi was exchanged for or equivalent to one US dollar. The sample includes nine local banks and eleven foreign banks. The local banks consist of six state and joint quasi-state-owned banks and three private banks. The foreign banks are dominated by eight regional banks from Togo and Nigeria, two from the UK and one from South Africa.

The second reason for the choice of the period 2009 -2013 is that by 2009, all licensed banks had complied fully with the IFRS which allowed for an effective comparison of accounting figures. Since the research uses accounting based

figures for analysis, the uniformity in standard of accounting brings additional benefit of international interpretation of results (Bushman and Williams 2012; Beatty and Liao 2014).

The type of data used in this study is mainly secondary. Data was sourced from the investor relations offices of sampled banks in Ghana, the internet, annual Pricewaterhouse banking survey reports which covered the period from 2009 - 2013, and the use of library resources for comparative articles on bank stability measurements.

Bank stability is measured using the Z-score computed from the return on average assets (ROAA), return on average equity (ROAE) and capital to total assets ratios (CAR)(Barth et al. 2013; Lepetit and Strobel, 2015). This is calculated for each bank in the sample for the year over the period 2009-2013.

A bank-level panel regression analysis is then used to assess the drivers of bank stability and to address the research questions above.

Using a panel data analysis, a test of panel data for autocorrelation, heteroskedasticity, and violations of exogeneity, linearity, normality were used to determine the choice of model to ensure the reliability of results and their robustness. For example, the tests for the use of any linear model, fixed or random effects model and generalised method of moments (GMM) estimators were based on the outcomes of the validation and robustness tests using the Hausman, Breusch-Pagan and Hansen Tests.

1.11.0 RESEARCH OUTPUT AND THE SIGNIFICANCE OF THE STUDY

The research has produced two important findings. Firstly, it uses the CAMELS composite score as the basis for assessing the stability of banks as against the current use of the CAMELS as standalone variables in many research works (Klomp and De Haan 2012; Beck et al. 2013).

Secondly, the Z-score rating index used in this study can be used as an additional monitoring tool for the Ghanaian regulator subject to the regulator's capacity to validate the quality of the accounting figures on which the figures are calculated. It can be used to rein in the management of banks who exceed their regulatory multiplier limits. Because assets are not risk weighted like the LR under Basel III it can be used to neutralise the inherent risks of asymmetric information on the part of individual banks, risk shifting arising from the current CAMELS assets risk weighting, business model conflicts, cross-border risks(Dermine 2015).

This study contributes to knowledge and bank management practice in two areas. Firstly, by documenting and advancing incrementally the understanding of current Ghana bank stability structures from the information derived from the data analysis. The analysis has shown that the overreliance on an individual CAMELS variable rating should be used with caution. The research shows that in assessing the stability of banks the Z-score rating should be compared to the CAMELS composite rating for banks in the jurisdiction before any proper, balanced and effective conclusions on the quality of their stability can be drawn.

Again, by expanding on the process of 'bank profit mining' the research has shown how local and foreign investors can use their group structure or conglomerates to protect their investments as an implied response to the frequent nominal increases in minimum bank capital required by the regulator. This type of regulatory dialectic (Casu et al. 2015) is detrimental to the stability of the banking sector and therefore supports the arguments put forward by Anginer et al. (2014) that regulatory measures should be well instituted to monitor and protect depositors.

In sum, this study contributes to knowledge and policy by exposing the inherent weaknesses in the existing assessment of bank fragility in Ghana, suggest measures to improve the assessment of fragility, and critically analyse policy options and their trade-offs in bank regulation in Ghana. These rearrangements are important to minimise the incidence of regulatory arbitrages both locally and across borders and to correct the imbalances created by not sequencing the liberalisation of the banking sector in an integrated manner.

The findings therefore support the urgent need to scale up the implementation of micro-prudential, macro-prudential, safety and resolution measures which reflect the needed regulatory structures required to realign incentives to banks to protect their franchise value as suggested by Honohan and Beck (2007) and Fuchs et al.(2013). Such regulatory measures will minimise distortions in bank risk-taking incentives and result in sustainable banking sector stability in Ghana.

1.12.0 LIMITATIONS OF THE STUDY

This research is limited to the regulation and risk management of Ghanaian banks from a top-down approach. Although it discusses regulatory design dimensions of stability definition, measurement, monitoring and controlling, it does not consider the tactical application of risk measures at bank operational level. Two interlocking tensions were recognised.

First, the study does not take into account the possible impact of other financial market institutions such as savings and loans, rural banks, finance houses, cooperatives and credit unions operating in Ghana. The second is the considerable segment of financial activities outside the banking sector due to the large informal sector and a large segment of unbanked customers typical of developing countries like Ghana (Fuchs et al. 2013).

This situation has put a severe limit on interpretation of the research findings, such as those relating to non-performing assets due to the paucity of interlocking information between the formal banking sector and the large informal sector.

1.13.0 STRUCTURE OF THE THESIS

This thesis is organised into eight chapters beginning with Chapter 1. This chapter provides an introduction to the thesis and covers the main reasons why the research is worth doing. This chapter therefore covers the background to the study, motivation for the research and its objectives, research questions, an overview of the contribution of the research and limitations to the research.

Chapter 2 discusses the Ghanaian environment, risk and regulatory regime. It provides the facts relating to the case study and the effect of the post 2008 banking deregulation. It critically examines the literature on the Ghana regulatory regime and the nature of bank-level risk taking activities. The gaps in the literature to support the purpose of the research are examined to reaffirm the need for this research.

Chapter 3 sets out to analyse the literature on the research on bank regulation and bank-level risk management practices. Specifically, it examines the main planks of banking regulation that include entry, exit and resolution, prudential supervision, accounting and corporate governance. It further provides a review of the theoretical and empirical literature on how these strands of literature emanating from these planks relate to banking stability measured by the Z-score and other components of the CAMELS as stability proxies. The literature is further critiqued to identify gaps in the literature to support current and future research.

Chapter 4 provides the research philosophy and discusses the theoretical perspectives of the conceptual framework which is framed on the gaps identified in the literature in chapters 2 and 3. The framework is then used to develop the research hypotheses that are examined in Chapter 7 to answer the research questions and justify the choice of the covariates in the research model.

Chapter 5 explains the methodology used in the study, which includes the selection of the sample and the data collection method. This chapter also

discusses the variables used to measure, conceptualise and operationalise the hypotheses, and includes a discussion of the statistical techniques employed to analyse the data. The chapter is divided into two. The first part of the chapter will present the methods to be used to undertake the descriptive statistics of the comparative CAMELS variables and the Z-scores.

The second part discusses, the dependent (Z-score) and independent variables namely: bank size; interbank borrowing and debt; non-performing loans; risk governance; regulatory independence; and origin. These variables are defined and the bases of their measurements are further explained. The theoretical and empirical sources of how the variables are measured are further discussed.

Since linear regression models will be used to assess the panel data, the OLS assumptions become important to identify violations of these assumptions and therefore provide the basis for the choice of appropriate methods to be used in Chapter 7. The underlying OLS assumptions of normality, homoskedasticity, linearity, no multicollinearity and autocorrelation, are defined and the required diagnostic tests carried out. These tests are provided as an appendix to this thesis. The theoretical framework for the tests of panel data using the Hausman and Breusch-Pagan tests which are used to support the choice of estimation techniques involving static panel data are also discussed.

Chapter 6 discusses the results of the univariate analysis of the data. Here descriptive statistics compare the CAMELS and Z-score scores among the sample banks. Correlation analyses and analysis of variance of foreign and local banks are compared to answer the first research question on the relative stability of licensed banks. The comparative outcomes of using the composite

CAMELS and the Z-score index are discussed. The policy implications of the findings and recommendations which include the need to improve the regulation on accounting for loan losses, minimisation of profit mining incentives and the need for deposit insurance are also discussed.

Chapter 7 discusses the empirical results. The empirical results based on the pooled OLS, fixed effects, random effects, and GMM models will first be discussed, followed by an analysis of the results based on the key research findings. The robustness or sensitivity of the results to the potential presence of autocorrelation in the panel data will be addressed by using the GMM HAC (heteroskedasticity and autocorrelation) option. The policy implications and suggested recommendations of the key research findings are also discussed.

Chapter 8 presents the conclusions of the thesis. It discusses the contribution of the research to the banking industry, bank management and practice and academia. It points out the main limitations of the study as well as potential avenues for future research and improvement.

CHAPTER 2

GHANAIAN BANKING ENVIRONMENT, RISK AND REGULATORY REGIME

2.1 INTRODUCTION

This chapter discusses the environment in which banks are regulated in Ghana. It critically examines the literature on the Ghanaian banking regulatory structures and discusses further how they impact on banking system stability.

Historically, the structure of Ghana's economy has been dominated by the primary sector, characterised by the production and export of primary products such as cocoa, gold, bauxite, foodstuff and timber (IMF 2014a). Ghana's economy has shifted from an agricultural producing economy in the 1980s to a service economy. Commerce, transport and other allied services now contribute more to the Gross Domestic Product (GDP) (IMF 2014a).

An analysis of the components of the country's GDP shows that the services sector accounts for over 59% of the GDP and employs about 47% of the active labour force. Banks form a critical part of the tertiary or services sector, which account for 48% of the Gross Domestic Product (GDP) (IMF 2014a).

Table 2.1 shows sectoral output and employment shares in 1980 and 2013.

Table 2.1: Sectoral Employment and Output Shares in 1980 and 2013

Sector	1980		2013	
	Percentage (%) of Gross Domestic Product (GDP)	Percentage of employment	Percentage (%) of Gross Domestic Product (GDP)	Percentage of Employment
Agriculture	60	62	26	42
Mining and Quarrying	1.2	0.5	8	1
Manufacturing	8.10	8.2	7	10
Other Secondary Sector	3.7	1.3	11	4
Tertiary Sector	27	28	48	43
Total	100	100	100	100

Source: Ghana Statistical Service and IMF Country Report 2013

Ghana mainly exports non-processed oil and non-oil commodities. Soft commodity exports notably cocoa, still forms the anchor of its foreign exchange earnings, followed by remittances and hard commodity exports like gold and other minerals(IMF 2013a).

Post 2002 saw further legal reforms that allowed for increased liberalisation of the banking sector, leading to an influx of regional and international banks (Bawumia 2010). The influx of the new banks enhanced competition in the banking sector and further banking reforms saw the abolition of the 35% secondary reserve requirement that required banks to invest in government securities. These reforms made expansions into new products and services possible for the banks (Bawumia 2010). Data from the World Development Index (WDI 2015) showed that real per capita income in Ghana had increased from USD 575.0 in 1980 to USD 752.1 by 2013.

On the economic front, Ghana's qualification for debt relief under the Highly Indebted Poor Countries (HIPC) initiative and the accompanying fiscal and monetary policy stance resulted in a significant reduction of the debt burden by the end of 2008 (IMF 2014a).

This situation has changed rapidly since the end of 2008. In 2008, Ghana's total public debt stood at GH¢10.14 billion (33.6% of GDP), equivalent to \$7.57 billion (IMF 2011). In the last five years, however, the stock of public debt has increased to GH¢49.7 billion (57.4% of GDP), equivalent to about \$20.12 billion at the end of 2013 (IMF 2014a). At the same time, there has been a dramatic increase in central bank financing of government recently (i.e. equivalent to the printing of money). Figures from the IMF show that net domestic financing of government exceeds the Bank of Ghana's own target (IMF 2015).

2.2 ECONOMIC ENVIRONMENT AND ITS IMPACT ON REGULATION AND BANKING SYSTEM STABILITY

Persistent deviations from the Bank of Ghana's actions and its set targets raise concerns about the Bank of Ghana's independence as well as the credibility of its inflation target regime (IMF 2013a). Levine (2012) suggests that a lower degree of central bank independence indicates weakness in the administrative and regulatory governance. The outcome also follows from the corruption of regulation, with appointments and extension of retirement age of senior officials of the Central Bank (Levine 2012). Under such an environment, political objectives can get in the way of effective monetary policy and hence weakening the credibility of the central bank in restraining government borrowing. Indeed, a policy commitment that is consistently breached cannot be credible.

The economic effects included the rapid deterioration of the domestic currency, the cedi. Studies on banks in emerging and developing markets show that depreciation of domestic currency can have a detrimental effect on bank performance and stability. Degryse et al. (2013) found that local currency depreciation increases banking system fragility in Asia and Latin America while Moyo et al. (2014) who examined 16 sub-Saharan countries including Ghana between 1995 and 2010 found similar evidence for sub-Saharan Africa. They stress that the stability of the banking system in a liberalised and competitive economy is contingent on government pursuing sound macroeconomic policies and enhancing the effectiveness of institutions to allow the banking sector to thrive.

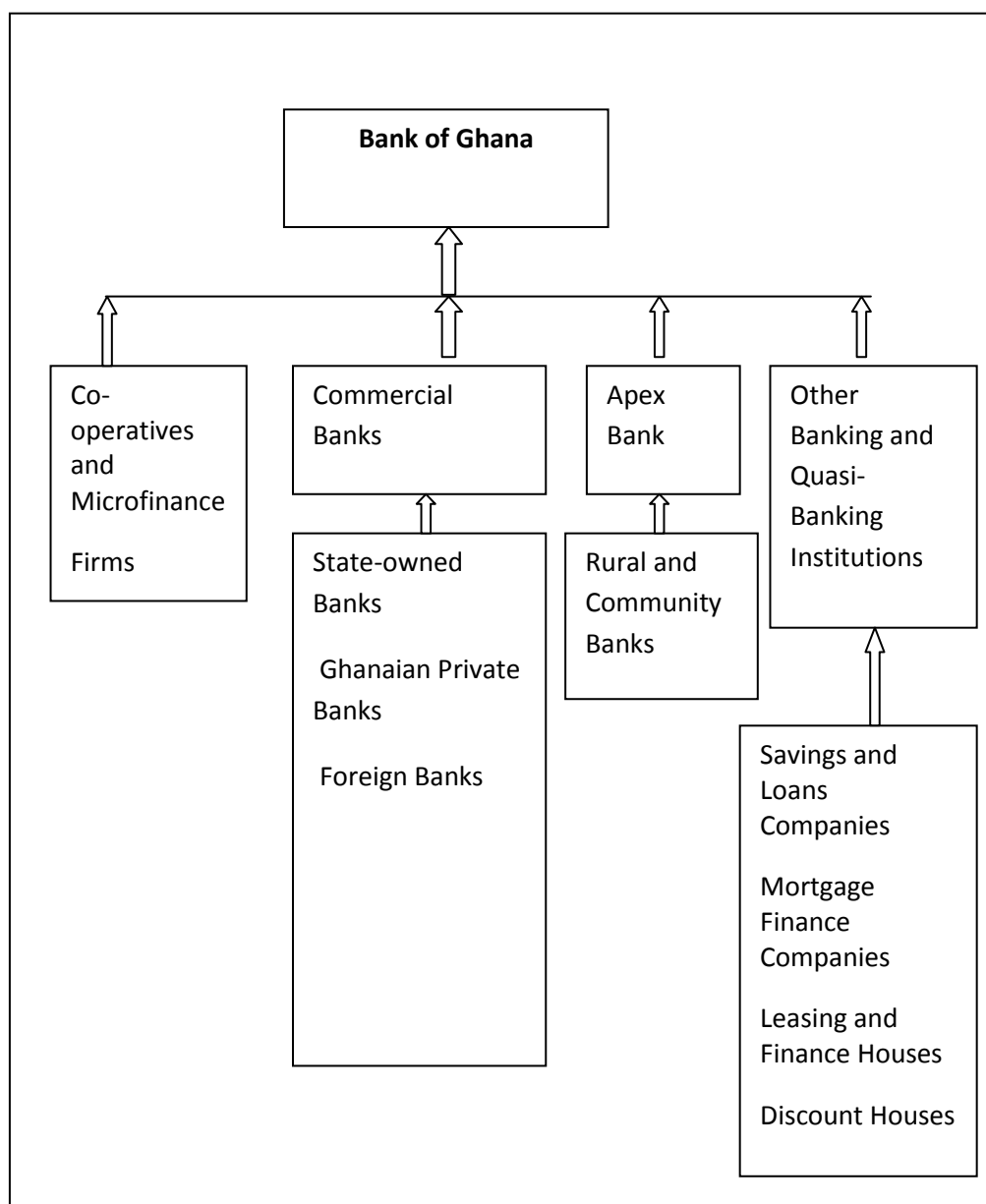
2.3 THE STRUCTURE OF GHANA'S BANKING SYSTEM

At the apex of the banking system in Ghana is the Bank of Ghana established in 1956 to provide the monetary policy of the government. Section 3, subsections (1) and (2) of the Bank of Ghana Act 2002, Act 612 expanded the Bank of Ghana's role to include the support of the general economic policy of the Government ; promotion of economic growth ; and effective and efficient operation of banking and credit systems in the country, independent of instructions from the government or any other authority.

The Bank of Ghana currently supervises 27 licensed universal banks, as well as other quasi-banking institutions which consist of savings and loans companies, mortgage finance companies, leasing and finance houses and discount houses (BOG 2014). Other powers relating to banking supervision and licensing are defined under the Banking Act of 2002 and 2004. In addition is the Payment Systems Act, 2003 which regulates Ghana's payment systems and processes. There are 136 rural and community banks operating under the umbrella association the ARB Apex Bank coming under the supervision of the Bank of Ghana as a way to promote financial inclusion in rural areas in 2013(BOG 2014). The recent co-operative credit union regulations, 2015 LI. 2225 places all co-operative associations whose banking model is largely that of the stakeholder value(SHV) firmly under the supervision of the Bank of Ghana. Microfinance firms are also regulated under the Microfinance Operating Rules and Guidelines (2011) (BOG 2011) in pursuance of the provisions of the Non-bank Financial Institutions Act, 2008 (Act 774) and the Banking Act, 2004 (Act

673) as amended by Act 738. Figure 2.1 illustrates the range of institutions supervised by the Bank of Ghana.

Figure 2.1: The Structure of the Ghanaian Banking System



Source: Author's Illustration.

Table 2.2 shows the composition of the Ghanaian financial system and their relative importance represented by the share of assets. The financial system in Ghana consists primarily of banks (IMF 2013a) and other quasi-financial

institutions, insurance and pension funds. The insurance and pension funds are regulated by the National Insurance Commission and the National Pensions Regulatory Authority (NPRA) respectively. Other investment firms are regulated by the Ghana Securities and Exchange Commission (SEC).

The universal license also allows banks to operate in the activities regulated by the other independent regulators. This situation suggests the possibility of regulatory arbitrage, overlaps, loss of economies of scale and scope due to overlaps which affect the efficient transmission and interpretation of information. Lower efficiency in the resolution of conflicts that may also arise due to different goals concerning supervision, can create a potential for financial instability as systemic risks can arise from a section of the financial system outside the control of the Central Bank (Doumpos et al. 2015).

Table 2.2 Ghana: Structure of the Financial System									
	2010			2011			2012		
	Number	Total Assets (GHC)	Percentage of Total Assets	Number	Total Assets (GHC)	Percentage of Total Assets	Number	Total Assets (GHC)	Percentage of Total Assets
Total Financial System		23,334,825,074	100		29,574,084,492	100		36,526,615,467	100
Commercial Banks	26	17,397,657,156	74.6	27	22,059,059,114	74.6	27	27,237,112,536	74.6
Non-Bank Financial Institutions		2,007,335,933	8.6		2,952,457,425	10.0		4,374,090,081	5.1
Rural and Community Banks	133	875,820,000	3.8	132	1,56,660'000	3.9	133	1,524,030,000	5.1
Other banking and Quasi-Banking Institutions		1,131,515,933	4.8		1,795,797,425	6.1		2,850,060,081	7.8
Insurance Companies		948,831,985	4.1		1,142,567,953	3.9		1,191,267,381	3.3
Pension Funds		2,981,000,000	12.8		3,420,000,000	11.6		3,923,649,782	11.6
Memorandum Items									
GDP (Millions of GHC)	46,236			59,816			73,109		
Total Financial Sector Assets/GDP	50.5			49.4			45.4		
Note ¹									
Note ²									
Capital market data was not included in this table.									
Since 2012 data for other banking and quasi banking institutions and pension funds is not available, the same growth as 2011 assumed									
Source: IMF Country Report 2013a									

2.4.0 BANK REGULATORY STRUCTURES AND BANK STABILITY IN GHANA

The discussion on the Ghanaian regulatory structure and banking stability relationship follows the five main planks of regulatory structures namely: entry; exist; supervision and regulation; accounting; and corporate governance (Ellis et al. 2014). These five planks therefore provide the framework on which the main strands of literature for discussion in this chapter are developed.

2.4.1 ENTRY AND ACTIVITY RESTRICTIONS

The IMF(2011b) study of the Ghanaian banking system shows that before 2009, the sector, had been dominated largely by state-owned banks with Barclays Bank and Standard Chartered Bank as important foreign banks. However, liberalisation of the banking sector led to the influx of foreign *de novo* banks from Nigeria, Libya, South Africa and some acquisition of local banks through the direct foreign purchase of shares (IMF 2014a). De novo banks are banks that enter the local market, set up new operations, compete for customers and business opportunities (Mulyaningsih et al. 2015). Entry activities cover licensing and restriction of activities.

The Banking Act 2004 recognises that banks can face a grave crisis when they are overexposed in some particular markets, geographic areas, or economic sectors. As required under sections 41- 49 of the Banking Act 2004, the following limits on exposures have been set. The regulatory regime limits all licensed banks' exposure to any one person or a group of persons to not more than 25% of the net own funds of the bank. Again, for the purposes of

subsection 42(2) the limits of the aggregate of unsecured financial exposure shall not exceed 10% of the bank's net own funds. However, the limit set does not apply to transactions between banks and licensed non-banking financial institutions, except otherwise specified by the Bank of Ghana.

From the empirical literature, Cubillas and González (2014) looked at the effect of bank liberalisation as a mechanism to encourage entry, restricting activity and risk taking. Theoretically, they argue that financial liberalisation influence bank risk through bank competition, removal of controls on international capital movements, and the relaxation of restrictions on banking activities. Notably, they find that in developing countries like Ghana, liberalisation negatively affects banks stability, not as a result of changes in competition but by expanding opportunities to take risk. Klomp and De Haan (2015) found that activity restrictions reduce the risk of large and foreign owned banks. Another strand of literature looks at competition on bank stability in developing or emerging countries including Ghana (Amidu and Wolf 2013; Beck et al. 2013; Moyo et al. 2014). While Beck et al.(2013) found that an increase in competition which erodes banks' pricing power, increases banks risk taking behaviour and negatively affects financial stability, Amidu and Wolf (2013) conclude that competition increases stability through banks' decision to diversify their portfolio in response to a competitive environment.

2.4.2 OWNERSHIP STRUCTURES OF GHANA'S BANKING SYSTEM

The second strand of literature relates the licensing regime to the ownership of licensed banks and their effect on banking stability (Bertay et al.2015; Mecagni, 2015; IMF 2014a). There are 27 commercial banks operating in Ghana as of 2013 (BOG 2014). Fourteen of these banks are subsidiaries of foreign banks and their market share is estimated at 51 per cent of bank assets. British banks dominate, but the combined share of banks from the Africa region is larger, particularly from South Africa, Nigeria, Togo and Libya (IMF 2011, 2013a).

The banking sector therefore has two ownership structures namely, public (also known as state-owned (SB)) and private banks. The private banks are further classified into foreign and domestic. The international banks are further decomposed into pan- African, regional and multinational banks (Mecagni et al. 2015).

Table 2.3 provides an overview of the shareholding of the 27 banks in Ghana. As at December 2013, 12 of the banks were Ghanaian-owned banks, 4 of which are state-owned banks. The state has a controlling interest through direct and indirect shareholding by the government, the BOG, and the state-controlled pension fund—the SSNIT. The SBs account for 29% of banking system assets, one of the highest in the Sub-Saharan Africa region. Public banks control over a fifth of assets and credit and a quarter of deposits. Their share of bank assets in 2012 had declined to about half of what it was in 2005(IMF 2013a).

The remaining 15 banks are a combination of pan- African banks (PABs), notably Ecobank, Zenith Bank, Union Bank of Africa; Access Bank and Stanbic

Bank. Standard Chartered Bank, Barclays, SG-SSB Bank are subsidiaries of international and multinational banks. First Atlantic Bank, International Commercial Bank (currently a subsidiary of the First National Bank of Nigeria), Guaranty Trust Bank are subsidiaries of regional banks.

Table 2.3. Overview of the Shareholding of Banks in Ghana			
	Bank	Classification and Mode of Entry	Main shareholders at end of 2013
1	Barclays Bank (Ghana) Ltd	Foreign / De novo	Barclays Bank Plc: 100%
2	Standard Chartered Bank (Ghana) Ltd	Foreign /De novo	Standard Chartered Holdings(Africa)BV: 69.42% Non-Controlling Interest: 30.58%
3	SG-SSB Limited	Foreign/ Acquisition of Local Bank	SG Financial Services Holding: 52% Non- Controlling Interest: 48%
4	First Atlantic Bank Limited	Foreign/ Acquisition of Local Bank	Kedari Nominees Limited: 83.10% Non-Controlling Interest: 16.90%
5	International Commercial Bank (currently First National Bank)	Foreign/ Acquisition of Foreign Bank	ICB Financial Group: 100%
6	Guaranty Trust Bank(Ghana Limited)	Foreign/ De novo	GTBank Plc: 95.37% Non-Controlling Interest: 4.63%
7	Ecobank	Foreign/ De novo	Ecobank Transnational Incorporated (ETI):68.93% Non – Controlling Interest: 31.07%
8	Zenith Bank(Ghana) Limited	Foreign/De novo	Zenith Bank Plc: 98.07% Non-Controlling Interest: 1.93%
9	Access Bank(Ghana) Limited	Foreign/ De novo	Access Bank Plc:100%
10	UBA	Foreign/ De novo	UBA Holding: 91% Non-Controlling Interest: 9%
11	Stanbic Ghana	Foreign/ De novo	Stanbic Africa Holdings Limited: 96.52% Non- Controlling Interest: 3.48%

Table 2.3 Overview of the Shareholding of the Sample Banks in Ghana (Continued)

12	Ghana Commercial Bank (GCB)	State-owned Bank(SB)	SSNIT: 29.8% MOFEP: 21.4% Non- Controlling Interest:48.8%
13	Agricultural Development Bank (ADB)	State –owned Bank(SB)	MOFEP: 51.8% BOG(FIT): 48.2%
14	National Investment Bank	State-owned Bank(SB)	MOFEP: 86.4% (55% when counting preference shares) BOG(FIT): 3.5% (45% when counting preference shares)
15	Prudential Bank Limited	Local Bank /Privately owned	J.S. Addo Consultancy:24.82% Mr. Kwesi Atuah:12.46% Trustees of PBL Staff Provident Fund:11.18% Mr. N.K. Omaboe:10.43% Ghana Union Assurance:10.29% Non-Controlling Interest:41.11
16	CAL Bank	Local Bank/ Privately Controlled	SSNIT: 33.18% ADPI Holding:28.66% Non-Controlling Interest:38.16%
17	Fidelity Bank Plc	Local Bank/ Privately Controlled	Africa Capital LLC: 43.26% SSNIT:13.58% ENO International LLC:12.64% SIC Life Company Limited:6.07% Non –Controlling Interest:24.45%
18	UT Bank Ghana Limited	Local Bank/ Privately Controlled	UT Holdings Limited:40.45% Deutsche Investition und Entwicklungsgesellschaft(DEG) MBH:13.52% Non-Controlling Interest: 46.03%

Table 2.3 Overview of the Shareholding of the Sample Banks in Ghana (Continued)

19	HFC Bank Limited	Local Bank/ Privately Controlled	Republic Bank Limited: 40% SSNIT:26.18% Other Private and Quasi- State Holdings: 33.82%
20	Unibank Ghana Limited	Local Bank/ Privately Controlled	HODA Group: 100%
List of Excluded Banks from Research			
21	Merchant Bank Ghana Limited	State-owned Bank(SB)	SSNIT: 90.2% SIC:9.8%
22	Bank of Baroda	Foreign/ De novo	Bank of Baroda, India:100%
23	Energy Bank	Foreign/ De novo	Global Fleet Group: 100%
24	Sahel Bank	Foreign/ De novo	Banque Sahole- Saharienne Pour L'Investissement et Le Commerce Tripoli(Libya) :100%
25	Bank of Africa(BOA)	Foreign/ through Local Acquisition	Bank of Africa West Africa: 93.35% Non-Controlling Interest: 6.65%
26	Royal Bank	Local / Privately Controlled	Alhaji Abdul Aziz Iddrisu and Family (Ghanaian share ownership): 100%
27	Capital Bank	Local / Privately Controlled	Ghanaian Ownership:100%
Bank of Ghana (BOG), Financial Investment Trust (FIT), Ministry of Finance and Economic Planning (MOFEP), Social Security National Investment Trust (SSNIT), State Insurance Company (SIC).			

Source: Bank of Ghana; Annual Reports of the 20 Banks from 2009-2013 and IMF Country Report 2013a.

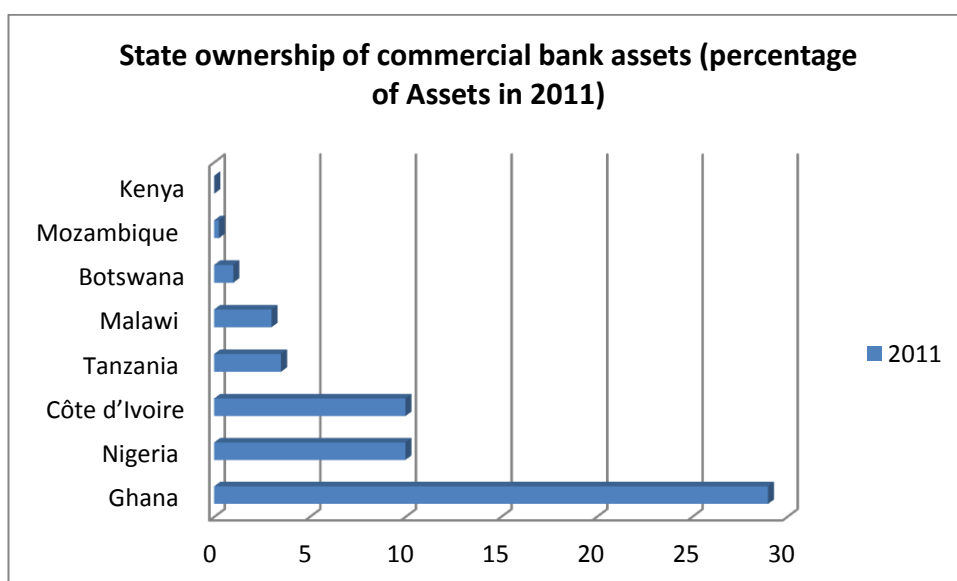
Table 2.4 Comparative Ownership in the Banking Sector in Sub-Saharan Africa 2010-2011

	State Ownership		Foreign Ownership	
	2000-2003	2010-2011	2000-2003	2010-2011
Middle Income Countries	0.1	0.1	0.6	0.7
Low Income Countries	0.2	0.1	0.4	0.6
Source: Adapted from Mecagni et al. 2015.				

The ownership structure of the sample banks brings together diverse public institutions, with different mandates and objectives. First the regulator, the Bank of Ghana has stakes in Agricultural Development Bank (ADB) and the National Investment Bank (NIB). The stakes are held through the Financial Investment Trust (FIT).

Comparing the ownership levels in Table 2.4, Figures 2.2 and 2.3 show that despite the increased share of assets of foreign banks in Ghana, foreign banks ownership of assets is relatively low compared with other middle income countries in sub-Saharan Africa by 2011 (Mecagni et al. 2015) due to the high incidence of state-owned banks and their asset holdings (IMF 2011).

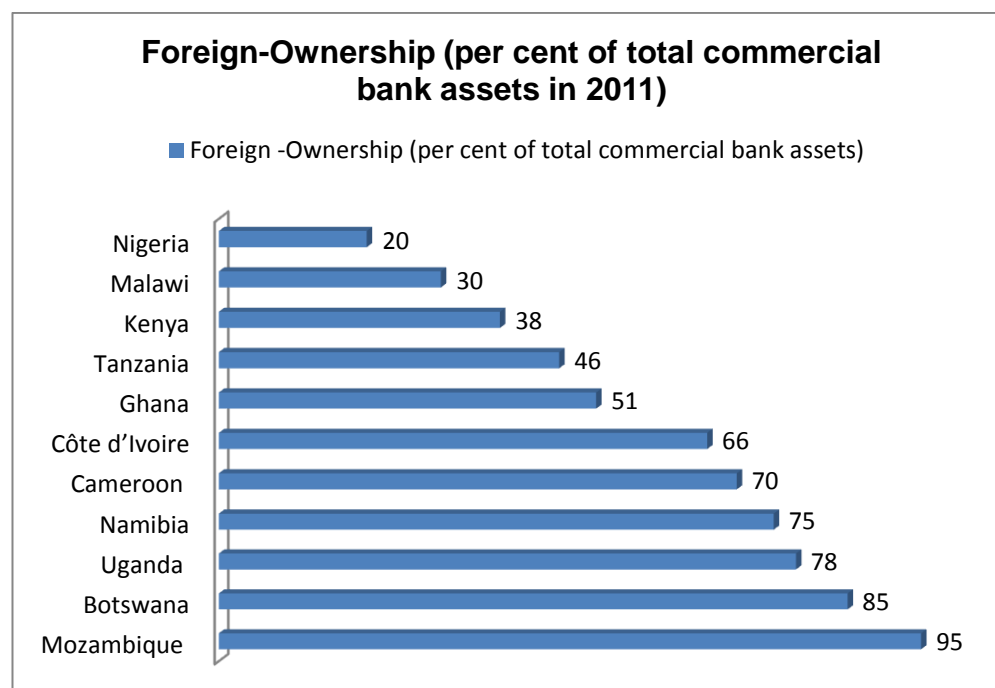
Figure 2.2: Comparative State ownership of banks assets in SSA



Source: IMF Country Report No. 11/131

Figure 2.3 shows the comparative level of foreign ownership of total commercial bank assets in eight major economies in sub-Saharan Africa in 2011.

Figure 2.3: Comparative foreign ownership of banks assets in SSA



Source: IMF Country Report No. 11/131.

The ownership structure has implications on the stability of the banking sector. The empirical literature shows that state-owned banks have different objectives from private banks (Brei and Schclarek 2015), while that of private banks have different perspectives depending on whether they are *de novo* banks or not (Mulyaningsih et al. 2015).

There are recent cross-country studies on bank ownership structure and banking stability capturing Ghanaian banking, from authors including Bertay et al. (2015) and Mecagni et al. (2015). In addition, there are many country studies on Ghana by the International Monetary Fund (IMF 2011, 2014a). The discussion by Bertay et al. (2015) which relates to Ghana, is based on the lending pattern of state-owned banks as to whether they are procyclical or not. They conclude that for developing countries including Ghana, credit or asset growth by state banks is procyclical in that state banks have a stabilising role particularly during a banking crisis.

Mecagni et al.(2015) discussion is also based on the role of evolving trends in sub-Saharan Africa. They show that since 1990, banking systems in sub-Saharan Africa (SSA) have steadily shifted from majority state-owned banking to private banking and toward higher levels of foreign ownership (Table 2.4).

In fact, the restructuring of state-owned banks and financial liberalisation allowed the entry of foreign banking institutions and contributed to higher competition. They find that state-owned banks have lost market share to foreign banks. The country-specific studies by the IMF (IMF 2011, 2014a) also show that the degree of foreign ownership in Ghana is also comparable to other

sub-Saharan African (SSA) countries but state ownership is among the highest as shown in Figure 2.2.

A review of the Banking Act, 2004, shows that the design of the entry and activity restriction appears to be less stringent. For example, interbank borrowings and asset holdings do not have any restrictions. Without such restrictions, monetary policy through the use lender of last resort, open market operation(OMO) to influence interest rates become less effective as banks borrow among themselves rather than through the central bank.

Again there is no attempt to pursue any structural regulation, which may involve restrictions on retail and investment activities (Gambacorta and van Rixtel 2013). The literature is also scarce on the effects of the emergence of cross-border banking groups that have seen the growth in their cross-border transactions, which are still not regulated effectively.

In addition, the BOG's role as a shareholder and as a regulator creates a conflict of interest situation which impairs its independent supervisory role and undermines banking stability (IMF 2014a). Ghana's financial system is currently dominated by foreign-owned banks. The implication of the dominance of foreign banks is that, cross-border contagion becomes an important risk and therefore requires that the monitoring of these banks is strengthened (Mecagni et al. 2015).

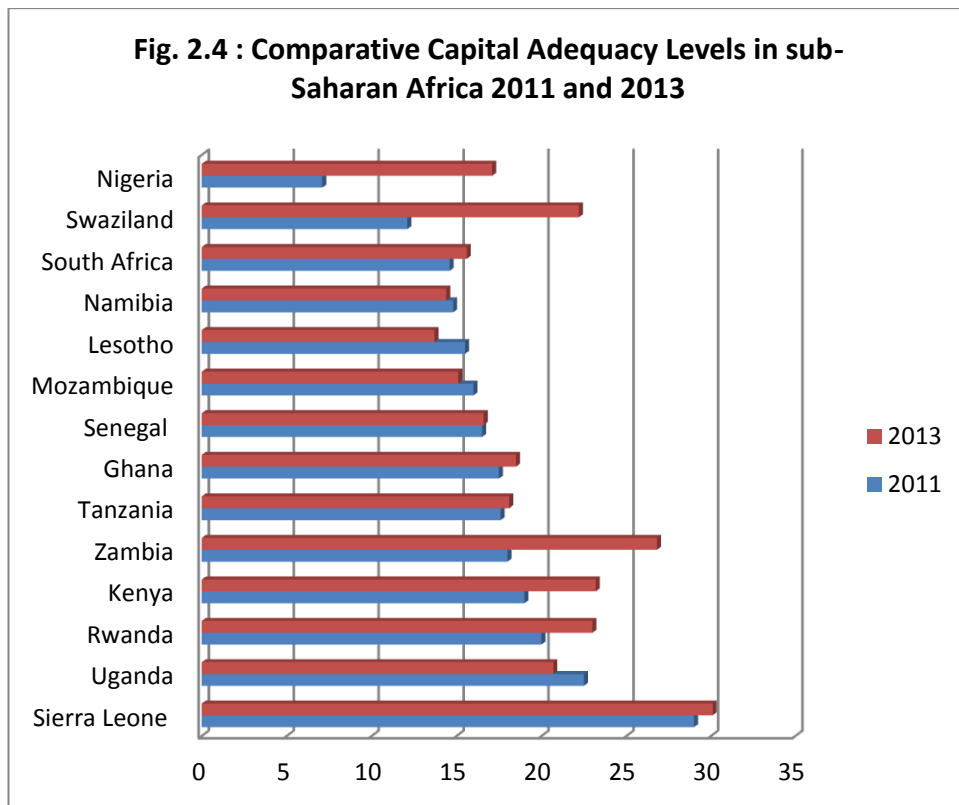
2.4.3.0 SUPERVISION AND PRUDENTIAL REGULATION IN GHANA

The risks posed by the banks – both public- and private banks call for a review of the current prudential regulation and supervision.

Specifically, section 23 of the Banking Act 2004 states that all licensed banks will maintain a minimum capital adequacy ratio of 10% computed in the manner that the Bank of Ghana may determine. Again banks are required to hold 11% of their current account holding (domestic) and foreign current account balances (foreign) at Bank of Ghana (BOG 2014).

Given the specificity of its financial system and the earlier Ghanaian financial crisis experiences, the current policy focus of the regulator has been on capital buffer and liquidity as a matter of priorities (Beck et al. 2011). Ghana's capital and liquidity regulation combines the mechanical role of capital as a buffer to absorb shocks and the incentive role of capital to promote effective screening, monitoring and thereby reduce the probability of default (Mehran and Thakor 2011).

The empirical literature on capital regulation and stability in Ghana has been discussed by Klomp and De Haan(2014,2015), Cubillas and Gonzalez(2014), and IMF (2013a, 2015). The comparative measure of capital regulation in Ghana and in sub-Saharan Countries is illustrated in Figure 2.4. Figure 2.4 shows that the level of capitalisation is comparable to other sub-Saharan banking systems. However, the issue of bank size and complexity of activities including the share of pan-African banking assets (Mecagni et al. 2015) need to be considered in evaluating the quality of the level of capitalisation.



Source: IMF (2013a) and WDI (2015)

More importantly, is the stability of the currencies which none is convertible which affects the quality of banks capital levels as a measure of stability buffer because they are largely nominal.

Klomp and De Haan(2015) using data for 1238 banks located in 94 developing and emerging countries including Ghana, discussed the strand of literature on developing countries on how bank regulation and supervision impact on bank risk taking (measured by the bank's Z-scores) and found that stricter banking regulation and supervision increase the stability score. Earlier, Klomp and De Haan(2014) studied 371 banks from 70 non-industrial countries including Ghana and found that stricter capital regulation and supervisory control

decrease banking risk. Liquidity regulation and activities restrictions also restrain banking risk but only in the case of a high level of institutional quality.

Cubillas and González(2014) discussed the impact of capital requirements on bank stability in countries that have liberalised their banking sector and find that capital requirements help reduce the negative impact of financial liberalisation on financial stability in developing countries.

The IMF (2013a, 2014) country study reports on Ghana used capital adequacy as a proxy for stability. The entire Ghanaian banking sector was stress tested. They concluded that banks in Ghana have adequate buffer at bank level and in the system in aggregate.

In modelling the stress test (IMF 2013a, 2014a) for example on Ghanaian banks, the assumptions involved in both tests were that 17% of all loans were classified as loss, in addition to an exchange rate shock of 51.2%.

The stress test results in 2013, show that only about two-thirds of all the banks would stay above the regulatory minimum capital requirement (IMF 2014a).

2.4.4.0 ACCOUNTING FOR BANKING SUPERVISION AND MONITORING

The regulatory system requires that licensed banks account for their activities in a transparent manner (Ratnovski 2013). Accounting is necessary to promote transparency given the opacity of many bank-level transactions between the banks and their customers.

In this respect, Section 53 (1) of the Banking Act 2004 mandates that the Bank of Ghana shall, for the purposes of supervision, require a bank to submit to it

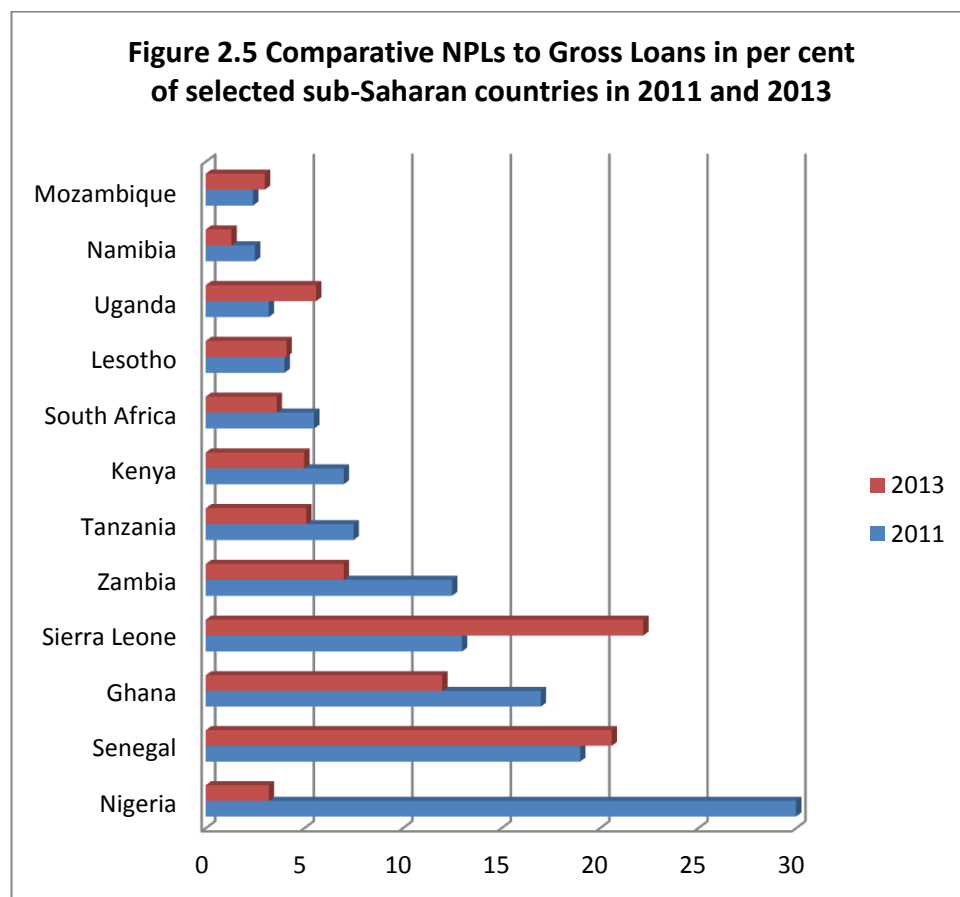
any information or data relating to the assets, liabilities, income, expenditure of that bank, or any of that bank's affairs, in the prescribed form, at an interval and within the times that the Bank of Ghana may stipulate, and that the bank shall comply with the requirement.

This micro-prudential role of regulation is exercised through data collection of financial, operational and compliance activities of banks for monitoring the stability of individual banks. The responses from the individual banks to these micro-prudential requirements are fashioned as Bank Supervision Department (BSD) Reports. They cover critical issues that trigger systemic risks and bank failures. The accounting reports are also used to assess the performance of banks.

The Bank of Ghana employs the CAMELS framework to obtain information on capital adequacy, asset quality or levels of non-performing loans which specifically affects the level of incomes and return on assets and equity. Again the level of assets impaired affect the level of liquidity and where assets structure may represent mismatches in terms of currency, the risk of instability is increased. Therefore, the method of recognising and calculating asset impairments is very crucial for ascertaining banking stability. In addition earnings (E), liquidity (L) and sensitivity to market risks(S) by banks form part of the reporting requirements. These reports are consolidated under the Banking Supervision Department (BSD) Reports. These reports are also used for the macro-prudential role of the bank through effective stress testing and qualitative assessment of the capital planning processes used by banks.

The issue of the quality of NPLs disclosures by Ghanaian banks leads to the plank of regulatory structure involving how banking risk-taking is accounted for in the Ghanaian jurisdiction. Čihàk et al.(2013) submit that non-performing loans do significantly affect asset quality due to less demand by regulators to pursue dynamic provisioning to accommodate deterioration in assets.

Figure 2.5 shows the comparative NPLs to Gross Loans (in per cent) of selected SSA Counties. This figure shows the level of assets deterioration in Ghana is comparatively high.



Source: IMF (2013a) and WDI (2015)

The literature suggests that there are further issues of underestimation due to a lack of dynamic provisioning despite the introduction and adoption of International Financial Reporting Standards (IFRSs) by 2009 in Ghana (IMF 2011).

Comparative supervisory standards with respective accounting estimation, compliance with BCP requirements, deposit insurance and asset classification is presented in Table 2.5 below. The table shows the low degree of implementation of the BCPs in the various sub-Saharan African countries.

Table 2.5 Summary Comparative supervisory standards by Country

	Country	Accounting Standard	Capital Adequacy Standard	Basel Core Principles	Deposit Insurance	Asset Classification
1	Angola	National	No Basel II yet	<50%	No Deposit Insurance	<90 days
2	Botswana	IFRS	Basel II in progress	>80%	No Deposit Insurance	90 days
3	Burundi	IFRS Plan	Basel II in progress	<50%	No Deposit Insurance	>90 days
4	Cape Verde	IFRS	Basel II in progress	50-80%	No Deposit Insurance	<90 days
5	Ethiopia	IFRS Plan	No Basel II yet	N/A	No Deposit Insurance	90 days
6	Gambia	IFRS Plan	No Basel II yet	N/A	No Deposit Insurance	90 days
7	Ghana	IFRS	No Basel II yet	<50%	No Deposit Insurance	90 days
8	Kenya	IFRS	Parts of Basel II/ III	50-80%	Implemented	90 days
9	Lesotho	IFRS	No Basel II yet	N/A	No Deposit Insurance	90 days
10	Malawi	IFRS	Basel II	50-80%	No Deposit Insurance	90 days
11	Mauritius	IFRS	Basel II	50-80%	No Deposit Insurance	90 days
12	Mozambique	IFRS	Basel II	50-80%	No Deposit Insurance	>90 days
13	Namibia	IFRS	Parts of Basel II	N/A	No Deposit Insurance	90 days
14	Nigeria	IFRS	Basel II in progress	50-80%	Implemented	90 days

Table 2.5 Summary Comparative supervisory standards by Country Cont'd

15	Sierra Leone	IFRS	No Basel II yet	N/A	No Deposit Insurance	90 days
16	South Africa	IFRS	Basel III	>80%	No Deposit Insurance	90 days
17	Swaziland	IFRS	No Basel II yet	N/A	No Deposit Insurance	90 days
18	Uganda	IFRS	No Basel II yet	50-80%	Implemented	90 days
19	Tanzania	IFRS	No Basel II yet	>80%	Implemented	90 days
20	Zambia	IFRS	No Basel II yet	>80%	No Deposit Insurance	90 days
Source: Enoch et al.(2015)						

These supervisory standards define the scope of the Bank Supervisory Department's (BSD) reports that are mechanisms to reinforce regulatory measures (Marques Pariera and Saito 2015) and to be more specific, in keeping with the capital, liquidity and accounting regulations.

From 2013, these BSD reports have been disaggregated into 98 regulatory reports and cover the requirements of bank stability, money laundering and international compliance issues, currency stability, management of monetary and fiscal policy interface. These reports provide information for monitoring changes in banking risks for regulatory action. These reports have the necessary legal backing from the Banking Act 2004, the Companies Act 1963, Act, 179), Payment Systems Act, 2003 (Act 662) and Foreign exchange Act 2006, Act 723.

Critically, the reports do not capture the needed consolidated balance sheet reporting of the foreign banks to help the regulator to prevent recycling of capital

by foreign conglomerates that have subsidiaries in Ghana. Again the reports do not have the same degree of rigour that are assigned to the measurement of liquidity coverage ratio (LCR), net stable funding ratio (NSFR) and leverage ratio(LR) under Basel III due to a lack of capacity to effect implementation.

The critique of the literature suggests that early implementation of Basel II and III regulatory capital requirements will improve the quality of banking supervision and monitoring in Ghana.

2.4.5.0 CORPORATE GOVERNANCE AND BANKING STABILITY

The commercial banks in Ghana have adopted the shareholder value (SHV) maximisation concept as their business model (BOG 2013). Compared with their counterparties in the developed countries, they are not involved in origination, hold and distribute (OHD) approach to risk taking. Governance guidelines have been introduced in 2013 to promote the status of risk management in Ghanaian banks (BOG 2013).

The SHV maximisation model, in keeping with the scope of operations hypothesis by Boone et al.(2007) stresses that the governance structure should reflect the scope and complexity of operations. The Bank of Ghana therefore introduced the governance guidelines to ensure that enterprise risk management is not only integrated in the management of Ghanaian banks but also an embedded culture (BOG 2013). Boards of all banks should have Risk Committees with a Chief Risk Officer (CRO) appointed as a key requirement.

The use of value at risk (VAR) in assessing the individual level of portfolio risks is also being encouraged to strengthen the level of risk rigour.

The main critique of the literature is that they are limited in scope and depth in relating corporate governance to bank stability in Ghana, if any, is remote.

Empirical literature on corporate governance and banking stability in Ghana is scarce and the few focus on listed firms which include some banks, with emphasis on corporate governance characteristics (board size, structure, CEO tenure) and firm performance and efficiency (Adusei 2012; Bokpin 2013).

2.4.6.0 EXIT OR BANK SAFETY AND RESOLUTION (SYSTEMIC MACRO –PRUDENTIAL) REGULATION

The strand of literature on exit covers that of bank safety, depositor protection and bank resolution (Ellis et al. 2014). It also discusses the possibility of individual banks in distress or the whole banking system and the role of the central bank in promoting the safety and soundness of the financial system (Casu et al. 2015:191).

The Central Bank theory expects the Bank of Ghana to play the lender of last resort function by providing liquidity and collateral, lower interest rates or pursue expansionary monetary policy, loosen collateral standards, support critical institutions, open special liquidity facilities in response to the macroeconomic circumstances of the financial system (Nier 2009). In this respect, the Bank of Ghana adopted an inflation targeting policy for its monetary policy in 2007 in line with stability measures as pursued in crisis countries as a proactive

measure for any contagion from external forces due to the changing asset holding structure in the Ghanaian banking sector (IMF 2011).

However, this change-over to an inflation targeting framework has not resulted in a more fundamental change in liquidity management, which continues to be based on reserve money targeting. Most banks participate in the interbank market, which is predominantly overnight and securitised (IMF 2013a).

On issues relating to banking sector resolution, the Banking Act 2004 (Sections 13, 14, 28, 60A, 60B, 62, 67 and 68) empowers the BOG to take remedial measures against institutions under stress, appoint an advisor to bank management, appoint a conservator, revoke the license of a bank, declare a moratorium, and appoint a liquidator. It also has blanket powers to facilitate mergers, wind up or take whatever action is needed. However, the legal framework lacks depth and is not stringent, allowing for regulatory forbearance (IMF 2013a). The current law does not distinguish between a temporal administration and bankruptcy. Again, there is no deposit insurance scheme, to deal with pre-processes of bank administration. In other words, the current regulatory framework has to be strengthened to allow the Bank of Ghana to exercise bank resolution options ranging from liquidation to purchase and assumption capacity and all its variants including bridge bank facility and open branch assistance, in keeping with international best practices (IMF 2015; Casu et al. 2015).

The review of the existing literature does not show the direct effect of not having a deposit insurance scheme. In a recent study by Dermirgüç–Künt et al.(2015)

Ghana was identified as one of the few remaining countries without an explicit deposit insurance scheme after the financial crisis as shown in Table 2.5 above. Compared to Nigeria that has introduced a deposit insurance scheme, this indicates a serious regulatory structural gap because it can serve as a key driver of financial sector inclusion and depositor protection (Mecagni 2015).

In the case of bank safety, the net effect of the lender of last resort (LLR) has been the growth in interbank borrowing increasing the degree of interconnectedness (BOG 2014). The possible effect has been the blurring of the distinction between systemic liquidity provision and unconventional monetary policy by the central bank (Nier 2009: 10). However, the current role and posturing by the Bank of Ghana shows that there has not been an effective preparedness towards the transition from lender of last to a market maker of last resort (MMLR) (Nier 2009: 10) an additional role of central banks arising from the current financial crisis (Oganesyan 2014).

2.5.0 SUMMARY OF CRITIQUE AND GAPS IN THE LITERATURE ON GHANAIAN REGULATORY STRUCTURE AND ITS STABILITY OBJECTIVES

The critique of literature on Ghana's regulatory structure on stability follows two dimensions. The first follows a strand of literature which examines how regulators have effectively implemented the BCPs in their respective jurisdictions or in Ghana. The second is the critique of the literature on Ghana on the basis of the five planks of its regulatory structure. The aim is to identify the gaps in the literature.

2.5.1 COMPARATIVE BCP FRAMEWORK AND GHANAIAN REGULATORY FRAMEWORK

The BCP framework is centred on seven pillars (BCBS 2012). The first is based on the preconditions for effective banking supervision which requires that the central bank should have its independence, supported by a legal framework to that effect in carrying out its mandate with respect to stability and monetary policy. The current independence of the central bank has been criticised for overbearing political influence on its monetary policy particularly in the financing of the public sector borrowing requirements (IMF 2014a). The incidence of regulatory forbearance; regulatory arbitrages as banks introduce bancassurance products that are regulated by an Insurance Commissioner, while the investment firms are also regulated by the Securities and Exchange Commission(SEC), where regulatory controls are less stringent provide a window for shadow banking(IMF 2011) which is a major issue for systemic risk(FSB 2016).

The second pillar is on licensing and structure. Ghana's approach to privatisation has been gradual and systematic, from partial sale to the full privatisation of banks to assure deposit safety and also to minimise the political complexities surrounding the disposal of state assets. In Ghana, the Bank of Ghana has remained as the functional regulator despite the licensing of universal banks. This has created co-ordination problems between the central bank and the other regulators as experienced in the UK (BOE 2009; Haldane 2012a; Doumpos et al. 2015).

The third pillar is on prudential regulation and supervision. The focus has been on capital adequacy and liquidity regulations. However, Basel II has not been implemented to date as compared with other middle income countries in sub-Saharan Africa (Mecagni et al.2015). The challenge is whether Ghana can leapfrog and implement the new Basel III standards. There is no literature on the possible effects of the new international regulation on Ghanaian banks. Moreover, the leverage ratios, LCR and NSFR ratios are yet to be considered as macro and micro-prudential controls compared to what is reported in the UK (Yan et al.2012) and in Japan (Koto et al. 2010) .

The fourth is the methods of on-going supervision. Currently, this is largely through on-site visits and the evaluation of BSD reports. Given the influx of foreign banks and their dominance or control over total banking assets and liabilities, the absence of consolidated and cross-border colleges is a matter of concern (Mecagni et al.2015). Although the CAMELS framework is being used to assess the stability of banks, alternative measures need to be tested. The recent stress testing of the entire banking system needs some improvement with the emphasis on credit risks, credit concentration risks, interest rates and currency depreciation shocks (IMF 2013, 2014a). Additional variables should include the withdrawal of funds by holders of government bonds, notably the international banks, significant (for example a 30 % fall) in foreign remittances, collapse of one of the pan-African banks among others (Enoch et al. 2015).

The fifth pillar is on the information requirements and in particular the accounting standards used to provide banking sector information (Beatty and Liao 2014). Although the banking sector has adopted the IFRS since 2009,

issues relating to loan provisioning and disclosures still remain as a challenge particularly given the various ways that assets, liabilities and incomes have to be accounted for either on an accrual basis, amortised or in the case of provisioning whether it has to be dynamic and recognised immediately or later (Beatty and Liao 2011; IMF 2015). There is also the problem of possible recycling of loans which also affects the disclosed income levels and the possibility that interest in suspense can filter through as recognised incomes (IMF 2011). Again under-provisioning reduces the resilience of the banking systems to adjust to shocks as provisioning fall short of losses (Chan- Lau 2012).

Risk weighting of assets have also been undermined by the government's non – compliance with servicing of its own debts. In the area of accounting, dynamic provisioning is yet to be adopted for regulation and the effect of such a method of recognising loan provisioning is yet to be tested to ascertain its effect on the entire banking system stability (IMF 2014a).

The Bank of Ghana has to some extent been able to exercise its power to revoke the licence of banks which fail to comply with regulatory norms. For example, in 2001, the licenses of two local banks, the Co-operative Bank and the Bank for Housing and Construction were withdrawn because they could not satisfy the minimum capital expected of licensed banks. However, such measures are ex-post and ex-ante measures are rather needed to minimise the economic effects of such potential violations as transparency may not be verifiable (Ratnovski 2013).

The final pillar is on cross-border banking. Consolidated accounting and supervision is yet to be effected. A supervisory college has also not been instituted (Enoch et al. 2015).

2.5.2 CRITIQUE OF LITERATURE ON REGULATORY STRUCTURES AND THE FIVE PLANKS OF REGULATION

The literature on Ghana's regulatory structure and its stability follows five strands. The first considers the effects of changing structure due to the liberalisation of the banking sector. It stresses the impact of liberalisation with caution but does not consider all the banks with material effect on stability. Cubillas and González (2014) considered only 12 major banks, while Klomp and De Haan(2015) considered only 5 banks major banks in their sample from Ghana. This means that the small and medium sized banks were excluded thereby missing the possible effect on the outcome of the research if these banks were included in their research. Another challenge is that the study covered different periods, some before the crisis and others after. For example, Cubillas and González (2014) study covered the period from 1991 to 2007, While that of Klomp and De Haan(2015) covered the period from 1999 to 2008. Both studies fall outside this research period in this study. Also the methodology used either by Cubillas and González (2014) or Klomp and De Haan (2015) differs contributing to mixed results. Overall the granular effects of local and foreign banks were not fully analysed. This research will take into account most of the state and the major local and foreign banks that will account for 96 per cent of the entire banking assets which contrast the size of banks selected from Ghana by Amidu and Wolfe(2013). It will therefore

examine if foreign banks impact positively or negatively on bank stability in Ghana.

The second strand also looks at accounting and its impact on the stability levels by using stress tests to complement the use of CAMELS to ascertain the degree of stability. The two IMF stress tests were biased in their assumptions by concentrating on the effects of NPLs, credit concentration and exchange rate fluctuations and did not consider the effects of other relevant variables such as the degree of interconnectedness measured by the level of interbank lending as identified by the influential Bank of England study on financial system stability (BOE 2009). The research will re-examine the impact of NPLs on bank stability to ascertain if they impact significantly on bank stability or not. Another gap to be filled is that the research will also examine the impact of bank interconnectedness on bank stability in Ghana. Alternative studies have used the Z-score notably, Klomp and De Haan(2015). Given these identified gaps in the literature, the current research therefore employs the same Z-score as an alternative measure of stability to that of capital adequacy ratio used in the stress tests. The current work while employing the use of the Z-score will also rely on accounting data since most of the banks excluded in the cross-country literature on Ghana are not on the stock market.

The third strand looks at compliance with the capital and liquidity regulation in Ghana. The critique is that there is no study to show if the criteria of the current Basel II and III liquidity and capital standards are applied, what the status of the stability of banks would be. This research will therefore use Prompt Corrective Action (PCA) thresholds as an index for the Z-score to ascertain the degree of

stability of Ghanaian banks as compared with the standard CAMELS framework.

The fourth strand looks at corporate governance and banking stability but indirectly through bank –level performance. The existing literature had focused on board size, structure, and composition but not on compensation and risk management skills. Empirical work on the emerging role of risk governance on banks in Ghana during the post crisis period is scarce. This research will therefore examine how risk governance impacts on the stability of banks.

Another strand of literature measured stability by using asset quality as a proxy by Alhassan et al.(2014). The critique follows the assertion by Casu et al.(2015) that the stability indicator used here is only an indicator of credit risks and not broad enough to reflect the entire risk taking activities as the insolvency risk that will be used in this research.

The next strand looks at the protection of banks as going concerns, depositors and mode of managing banking resolutions. The literature only recognised Ghana as having implicit insurance but did not discuss the appropriate deposit insurance type for developing countries and how they can mitigate potential moral hazard issues raised. The issue is the central bank's role as lender of last resort. It is yet to be tested if the liquidity instruments currently available to the central bank are adequate to provide the needed agility as market lender of last resort (MLLR) should there be a situation of systemic bank failure(Nier, 2009). The alternative had been the central bank and government directly participating in direct banking activities to assure depositors that their deposits

are safe. In a cross-country study including Ghana, Bertay et al.(2015) also took into account only 4 Ghanaian banks in ascertaining the performance of state and private foreign banks. This also indicates limited granularity in their research findings with respect to Ghana. This research will include almost all the state-owned banks and examine if government and central bank participation in banking is impacting positively or negatively on bank stability in Ghana.

The next chapter will review prior empirical studies on the relationship between bank stability and regulatory structures and bank-level risk taking using examples from the developed and developing countries in order to identify other gaps in the literature.

CHAPTER 3

EMPIRICAL LITERATURE REVIEW

3.1 INTRODUCTION

This chapter reviews the theoretical and empirical literature on regulatory structures and bank stability. It reviews the literature on the five key planks of any well-defined regulatory regime: entry – that is, competition policy; exit – that is resolution policy; regulation – that is, supervisory policy; accounting – that is, auditing and valuation policy; and governance (Ellis et al. 2014) and how they affect banking sector stability. The literature review therefore focuses on the main strands of literature on how these five key planks affect banking sector stability.

3.2 PRUDENTIAL REGULATION AND BANKING STABILITY

The literature on prudential regulation follows two strands in the form of capital regulations and supervision and how they impact on bank stability. Depending on the type of tool used, its objectives and scope of application, capital regulation and supervision, is classified into micro-prudential or macro-prudential (ECB 2014). Regulations have been the dominant way of ensuring the stability of banks (Chaudhry et al. 2015).

3.2.1 MICRO-PRUDENTIAL REGULATION

Micro-prudential regulation is the traditional approach to bank regulation and concerns the stability of individuals and the protection of clients of the

institutions. It examines the responses of an individual bank to exogenous risk but does not incorporate endogenous risk neglecting the systemic implications of common behaviour. It comprises, for example bank entry restrictions, capital requirements, restrictions on bank activities, how instruments are listed, traded, sold and reported and measures of value and riskiness of assets, etc.(Ashton 2013). Haldane (2012b) argues that the safety of individual banks is neither a necessary nor sufficient condition for systemic stability.

Conduct of business regulation examines how firms operate in financial markets. Part of this role is to ensure customers are protected from bad advice; firms do not become insolvent before contracts are fulfilled; and customers have some protection from misrepresentation, incompetence and misselling (Ashton 2013).

The main criticisms levelled against micro-prudential regulation have been supervisory problems associated with the lack of effective information and coordination due to their structural nature and weak legal backing. The second was regulatory capital arbitrage, the process of inflating a bank's capital adequacy ratio without increasing the actual safety or soundness of the bank. This is done mainly through securitisation, off- balance sheet transactions, exploitation of inconsistencies in Basel risk prices. Another factor is the strategy of banks that leads to a decrease in the regulatory measure of risk-weighted assets by more than the actual risk exposure of the bank, making the bank look safer than it actually is. The existence of regulatory capture also neutralised the very importance of these indicators. Moreover, overreliance on the belief or hubris that 'market knows best' also created regulatory complacency

(Fullenkamp 2013). These features were complicated by the manifestations of financial deregulation and liberalisation and the rise of the sophisticated risk management technique the value at risk (VaR).

However, the recent financial crisis has brought out a strong critique of the pervasive use of VaR by regulators. Jobst (2012) argues that it is important to recognise that VaR, the dominant form of risk measurement in the financial sector, was invented by banks as an internal risk management tool for comparing risks across desks and asset classes within a bank. It was never meant to be a tool for regulating banks. The need for economic foundations for a systemic risk measure is therefore more than an academic concern. In this regard, Acharya et al. (2010 a,b) believe that the lack of such a measure is at the root of practical failures of regulation.

3.2.2 MACRO-PRUDENTIAL REGULATION

Giese et al.(2013) argue that macro-prudential policy seeks to maintain financial stability by explicitly accounting for the 'externalities' arising from the behaviour of individual institutions as well as the structure of the financial system. Macro-prudential tools have been proposed to counter the pro-cyclicality of the banking system caused by risk-related capital adequacy, 'mark-to-market' accounting, and backward looking provisioning against bad and doubtful debts. Examples of these are countercyclical capital and liquidity requirements, and non-risk related capital ('leverage') ratios; a levy on the outstanding debt multiplied with a factor of average time-to-maturity of a bank; and a levy on non-core liabilities (Hanson et al. 2011); and forward looking provisioning, for which allowance has been

made via changes in the international accounting standards to permit forward looking 'general' provisioning (Gaston and Song 2014). Macro-prudential supervision therefore focuses on reducing asset price inflation, and thus the need to insure against bank failure; it hence protects taxpayers from the need for bail-outs (Haldane 2010).

The European Central Bank (ECB 2014) argues that in spite of the frictions that may arise between them, micro- and macro-prudential policies overall complement each other, and that the two policy domains play an equally important role in ensuring financial stability. To benefit most from their complementarities, it is essential that there are constructive cooperation and information sharing between micro- and macro-supervision to ensure the improvement of social welfare by aligning private incentives with social objectives (Giese et al. 2013).

3.2.3 THEORETICAL LITERATURE ON REGULATORY CAPITAL AND BANK STABILITY

Many theories suggest that capital improves a bank's survival probability. First, the monitoring-based papers by Allen et al.(2011) and Mehran and Thakor (2011) suggest that higher bank capital induces higher levels of borrower monitoring by the bank, thereby reducing the probability of default or otherwise improving a bank's survival odds indirectly by increasing the surplus generated by the bank– borrower relation. The asset-substitution moral hazard theories argue that capital attenuates the excessive risk- taking incentives induced by

limited liability and government protection, and that banks with more capital optimally choose less risky portfolios (Mehran and Thakor 2011).

Some theories seem to suggest that higher capital does not promote stability (Besanko and Kanatas1996). On balance, however, most theories, especially the more recent ones, predict that capital positively affects bank survival.

Cole and White (2012) use proxies for the CAMELS components and other factors to explain bank failures during 2009. They find that capital is one of the factors explaining failure. Beltratti and Stulz(2012) examine what explains bank performance during the recent subprime lending crisis and find that capital is one of the determinants.

While higher capital is undoubtedly useful, it is important to realise its limitations. First, while the cost of bank capital appears modest in steady state, the cost of building up capital quickly may be significant. This makes bank capital scarce during and after recessions. Second, banks often obtain new capital from passive shareholders (such as preferred equity holders or institutional investors), who are unable to influence bank risk taking (Acharya et al. 2012a, b). Thus, higher bank capital provides risk absorption capacity but does not correct risk attitudes.

3.2.4 EMPIRICAL LITERATURE ON CAPITAL REGULATION AND BANK STABILITY

Many country studies about the introduction of the Basel III capital regulation by Barrell et al.(2009); Kato et al(2010); Wong et al.(2010); Miles et al.(2011) using prediction models conclude that capital regulation promotes stability.

Another group of writers; Yan et al.(2012); Calmes and Thiertet (2013); King (2013);Chalermchatvichien et al. (2014); Hong et al(2014) using regression and accounting based methodologies also conclude that the Basel capital reforms impact on liquidity which also lead to improved banking sector stability.

A number of studies, Klomp and De Haan (2012); Berger and Bowman (2013) compare the impact of capital ratios on low risk and high risk and small and large banks. Contrary to the above, Klomp and De Haan (2012) find that the impact of regulation and supervision on bank risk taking is not uniform with the finding that regulation and supervision do not have an effect on low risk banks. Berger and Bowman (2013) find that capital enhances the survival of medium to large banks only during a banking crisis. They conclude that capital ratios correlate positively with the stability of small banks. Likewise, low risk banks are less affected by capital ratios.

The majority of empirical studies by Barrell et al.(2009); Kato et al(2010); Wang et al.(2010); Miles et al.(2011); Calmes and Thiertet (2013); King (2013); Chalermchatvichien et al. (2014); Hong et al. (2014); Vazquez and Federico (2015) used liquidity(LCR and NSFR), capital ratios and Z-score as proxy measures of bank-level stability. The majority of the studies conclude that the

introduction of leverage capital ratio notably LR and LCR will improve stability. Specific country studies by Barrell et al.(2009); Kato et al(2010); Wang et al.(2010); and Miles et al.(2011), found that Basel III capital and liquidity ratios will improve bank stability.

3.2.5 CRITICAL REVIEW OF LITERATURE

Tables 3.1a- 3.1c show the summary of literature on prudential regulation and bank stability. The critical review of empirical literature shows that they are largely post crisis literature. Empirically they do not reflect full implementation yet which will take effect in 2018. Bank stability criteria have not been defined consistently with varying variables. Methods of estimation also yield different results. On balance capital regulation positively affects banking stability. However, it is unclear how the whole architecture performs over the cycle, considering also that risk weights themselves may be cyclical and that there are also countercyclical buffers. In addition, critics of the leverage ratio suggest that it incentivises riskier lending. This is not decisive however. Research at the ECB showed that this effect is small and outweighed by the benefit of greater loss absorbing capacity (Grill et al. 2016).

Finally, the evidence of the impact of Basel III on sub-Saharan countries' banking system is scarce because most are yet to implement the Basel II except for South Africa (Enoch et al. 2015).

Table 3.1a: Empirical Literature on Prudential Regulation and Bank stability						
Author (Year)	Study Period	Reference Country	Methodology	Bank risk-taking variable	Summary results	
Empirical country research showing the relationship between capital regulation and stability using crisis prediction models						
Barrell et al.(2009)	2007-2008	UK Banking sector	Reduced	Capital Adequacy or Liquidity ratio	Increasing the levels of capital and liquidity by 1% would have reduced the probability of a crisis in the UK by more than 6%, and by smaller amounts in other countries.	
Kato at al. (2010)	2005-2009	Japanese Banking Sector	Reduced	Liquidity Ratio and Liquidity Ratio	By introducing a 1% increase in the capital ratio, the probability of a crisis occurring will fall by 3.10% without any increase in liquidity. The probability of a crisis occurring will fall by 2.8% when a 1% increase in the capital ratio as well as a 10% increase in the deposits-to-total-assets-ratio are implemented	
Wong et al.(2010)	2010	Hong Kong Banks	Reduced	Capital ratio(TCE/RWA)	Further reductions in the probability of a banking crisis from an increase in the tangible common equity ratio beyond 7% may not be significant. The marginal benefit becomes virtually zero when the TCE/RWA ratio is higher than 11%.	
Miles et al . 2011)	2010	UK Banks	Stress Testing	Capital ratio(TCE/RWA)	The probability of a crisis occurring will fall from 4.57% to 0.75% if banks increase their capital ratio from 5% to 20%.	

Table 3.1b: Empirical literature on Prudential Regulation and Bank stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Gauthier et al. (2012)	2005-2009	6 Canadian Banks	Network Model	Leverage	Leverage is positively correlated with the change in capital requirements supporting Basel III macro-prudential capital initiatives.	
Klomp and De Haan(2012)	2002-2008	200 banks from OECD	Factor Analysis	25 variables including Z-score to represent bank risk	Impact of bank regulation and supervision of bank risk is not uniform. Regulation and supervision do not have much effect on low-risk banks. Banking regulation do have a highly significant effect on high risk banks .	
Yan et al. (2012)	1997 -2010	12 UK banks	Non –linear in –Probit Model	NSFR and LCR	Basel III will have a significant net positive effect on the UK economy.	
Berger and Bowman(2013)	1984-2010	57,243 small banks; 1,946 medium and 1,400 large bank quarter observations	Logit survival Regression and OLS	Capital Ratios	Capital enhances the survival probability of small banks at all times and in the case of medium and large banks , only during a banking crisis.	

Table 3.1c: Empirical literature on Prudential Regulation and Bank stability					
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results
King (2013)	2009	529 Banks	Accounting – based computation of NSFR for Comparative	NSFR	There is a trade-off between liquidity regulation, bank risk and profitability.
Chalermchatvichain et al.(2014)	2005 - 2009	25 Asian Banks	OLS and 2SLS	Z-Score and Volatility change in Equity	Net Stable Fund is significantly related to bank Z-score. Basel III would have been successful in reducing the degree of risk –
Hong et al (2014)	2001- 2011	9,349 Banks	Discrete time Hazard Model	LCR Standard	Banks tend to increase the LCR if they anticipate financial distress, if they have high insolvency risks or if they face deteriorating economic condition. Consistently, negative relationship between NSFR and bank failure.
Vazquez and Federico(2015)	2001- 2009	11,000 banks in USA and Europe	Probit Model	LCR and NSFR	A 3.5 percentage point increase in the pre-crisis capital buffers of Global banks would have caused a 48 percentage point in their probability of failure during the crisis. The results support the proposed Basel III regulations on structural liquidity and leverage, but suggest that emphasis should be placed on the systemically-important institutions.
Source: Constructed from the Empirical Literature					

3.3.0 PRUDENTIAL SUPERVISION AND BANK STABILITY

The prudential supervisory activities of regulators include: licensing, authorisation, chartering of financial institutions('fit and proper' test); the on-going monitoring of the health of an institution and financial system, especially, asset quality, capital adequacy, liquidity, internal controls; the sanctioning or imposition of penalties in cases of non-compliance; and crisis management, including insolvency procedures. Supervisory regulations typically include loan classification, stringency provisioning standards, and diversification guidelines, and regulations fostering information disclosures and private sector monitoring of banks (Ashton 2013).

3.3.1 THEORETICAL LITERATURE

The first theory holds that a strong official supervision of banks can improve their corporate governance, known as the "supervisory power view." The second is the "political/regulatory capture view," which argues that politicians and supervisors do not maximise social welfare; they instead maximise their own private welfare. The third is the "private empowerment view" which argues that bank supervisory policies should focus on enhancing the ability and incentives of private agents to overcome information and transaction costs, so that private investors can exert effective governance over banks (Ashton 2013).

In their highly stylised model, Buck and Schliephake (2013) introduce supervision and capital standards as parameters that respectively govern the banking sector directly and indirectly in the development of efficient banks. In their model, supervisory effort is endogenised. The model output leads to their

argument that if countries are not homogeneous with respect to their supervisory efficiency or degree of capturing, any international capital requirement standard such as the Basel Accord, that neglects supervisory efforts leaves room for free-riding, and thus may even destabilise the global financial sector. Their model suggests that the implementation of binding minimum supervisory standards is essential for international financial stability.

3.3.2 EMPIRICAL LITERATURE

Several studies examine the effectiveness of bank regulation and supervision on bank stability, and the empirical evidence on the relationship are mixed. Demirgüç, -Kunt et al. (2008), who focus on bank-level indicators for 203 banks from 39 countries, report a positive correlation between bank soundness using the Z-score and the overall index of Basel Core Principles (BCP) compliance as an indicator of good regulation and supervision.

Beltratti and Stulz (2012) found no convincing evidence that tighter regulation in general was associated with better bank performance in their sample of 164 large banks (assets in excess of \$50billion in 2006) from 32 countries during the crisis or with less risky banks before the crisis. Similar findings are reported by Demirgüç, -Kunt and Detragiache (2011). Employing data of 3000 banks from 86 countries, they do not find support for the hypothesis that better regulation and supervision result in sounder banks.

However, there is also some evidence suggesting that better regulation reduces bank riskiness. Using data of almost 200 banks from OECD countries for the period of 2002 to 2008, Klomp and De Haan (2012) show that while bank

regulation has little impact on risk taking by low-risk banks, it significantly alters the behaviour of high-risk banks. Similar results are reported by Klomp and De Haan (2015a) for a sample of emerging and developing countries.

Carretta et al. (2015) extend the literature on supervision and bank stability examining the supervisory cultural orientation on bank stability. Using a sample of 6,000 banks in 15 EU countries, they reported that supervisory culture oriented towards power distance and normative are not effective in increasing stability. On the other hand, greater supervisory cultural orientation to collectivism increases stability.

Shehzad and De Haan (2015) identify different types of powers assigned to supervisory agencies before the recent financial crisis and examine the extent to which these powers are related to riskiness of banks in high-income OECD countries during the crisis. They conclude that monetary penalties may lead to reduced effort by management in deciding on the selection of loans given the lower monetary incentives. In contrast, supervisory powers to introduce organisational changes that put the managers' jobs and owners' profits at risk can induce more discipline.

3.3.3 CRITICAL REVIEW OF LITERATURE ON PRUDENTIAL SUPERVISION AND BANK STABILITY

Tables 3.2a and 3.2b present some empirical literature work on prudential supervision and bank stability. There still remains lack of uniformly defined and internationally accepted supervisory standards due to the unobservability and non-contractibility of supervisory standards (Buck and Schliephake 2013). Again

countries are not homogeneous with respect to their supervisory efficiency or degree of capturing banking risk, due to variations that exist in supervisory culture, structure and scope of supervisory activities.

Supervisory importance also varies depending on whether the sample is developed, emerging or developing country. This leads to mixed results about the significance of supervisory activities as a standalone measure in guaranteeing banking stability. Again differences that exist between bank – based and market based financial systems lead to different measures of stability measures in the examination of the relationship with supervisory practices. The research undertaken so far does not provide the indices that reflect the stance of regulators as being active or passive during the crisis.

Table 3.2a Summary of literature on Prudential Supervision and Bank stability					
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results
Demirgüç ,Kunt et al (2008)	1997 -2010	203 banks from 39 countries	2SLS estimation	Z-score and Credit Rating	There is a positive relationship between bank soundness and compliance with information provision, but the relationship weakens once the study includes low income countries in the sample.
Demirgüç ,Kunt and Detragiache (2011)	1997 -2010	3000 Banks from 86 countries	OLS	Z-score	Neither the overall index of BCP compliance nor its individual components are robustly associated with bank risk measurement by individual bank Z-scores. They also fail to find a relationship between BCP compliance and systematic risk measured by a system –wide Z-Score.
Beltratti and Stulz (2012)	2005-2009	164 Large Banks from 32 countries	Multiple Regression	Z –score and beta	Banking regulation and supervision of banks from countries that had more restrictions on banks in 2006 fared better during the crisis. Because no evidence exists that these banks had less risk exposure banks with more restrictions on their activities could have had higher returns because they did not have the opportunity to diversify into activities that unexpectedly performed poorly during the crisis.
Klomp and De Haan(2012)	2002-2008	200 Banks from 21OECD countries	Factor Analysis	Z-score and CAMELS variables	Regulation and supervision do not have an effect on low risk banks, while dimensions of bank supervision and supervision do have a highly significant effect on high-risk banks.

Table 3.2b Summary of Literature on Prudential Supervision and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Carretta et al.(2015)	1999-2011	EU 15 6000 Banks	Two –step GMM	Z-score	A greater supervisory culture orientation to Collectivism (COL) increases banks' stability. a supervisory culture oriented to Uncertainty Avoidance is positively related to banks' distance to default. Conversely, supervisory cultures oriented to Power Distance (POW) and Normative (NOR) have a negative and statistically significant effect on banks' distance to default. Effect on banks' distance to default.	
De Jonghe et al.(2015)	1996-2010	2199 Banks	Multiple Regression	Marginal Expected Shortfall (MES) or Bank systemic exposure	For medium –sized and large banks, an improvement in the strength of supervisory power leads to a significant lower impact of net Interest Income (NII) on MES. Supervisory power is more effective for large bank behaviour.	
Doumpos et al. (2015)	2000-2011	1,700 Commercial Banks from 90 countries	Hierarchical Linear Modeling or Multi – Level Modeling	Z-Score	Separating prudential supervision into central bank independence, supervisory structure and supervisory unification. Supervisory independence is only found to be statistically and significantly or and positively affecting bank soundness. Bank supervisory structure does not significantly affect bank soundness. But only at the 10 per cent significance level.	
Klomp and De Haan(2015)	2002-2008	1238 Banks located in 94 developing and emerging countries	System GMM	Z –score	Supervisory control significantly reduces banking risk. If the level of supervisory control increases by 1%, banking risk decreases by 0.4%.	
Shehzad and De Haan (2015)	2007-2011	8000 Banks from high income OECD countries	Hausman –Taylor estimates	Z-score and Impaired loans to gross loans ratio	Supervisory powers that introduce organisational changes that put the managers, jobs and the owners profits at risk can induce discipline or reduce more risk taking by banks.	
Source: Constructed from the Empirical Literature.						

3.4.0 BANKING ENTRY AND BANKING STABILITY

The liberalisation of the banking sector to competition both within and across borders of countries has led to two strands of literature that the role of market structure emerges as a crucial topic. Both economic theory and empirical evidence are inconclusive about the impact of increasing banking market concentration on financial stability (Uhde and Heimeshoff 2009).

3.4.1 THEORETICAL LITERATURE

More precisely, the impact of competition and market concentration on the probability of a financial crisis appears to be of primary interest. There are two opposing theories “competition-fragility” and “competition –stability” nexus with the predictions of theory being ambiguous (Bretschger et al. 2012).

A positive relationship between market concentration and financial system stability is observed when more concentrated markets allow banks to earn higher profits, which serve as a buffer against unexpected shocks (concentration-stability hypothesis). On the contrary, higher market concentration is associated with lower financial stability when market power induces banks to charge higher interest rates to borrowers, so that borrowers take excessive risks and raise the risk of default and destabilisation (concentration-fragility hypothesis).

In their theoretical models, Martinez- Miera and Repullo(2010) and Hakenes and Schnabel (2011) and show that a lower correlation of loan defaults makes it more likely that fiercer competition harms stability. If default correlation is high,

one expects to see a reduction in the probability that competition–fragility view is favoured over the competition-stability model (Beck et al. 2013).

Freixas and Ma(2013) developed a model in which leverage is made endogenous. Their model shows that the effect of competition on stability differs from different measures of bank stability and different types of banks. This finding may explain the inconclusive results in the competition-stability nexus from the empirical literature (Bremus 2015).

Berger et al. (2009), using data for banks in 23 industrialised countries, had earlier shown that the two strands of the literature need not necessarily yield opposing predictions regarding the effects of competition and market power on stability in banking.

3.4.2 EMPIRICAL LITERATURE

Many empirical studies (Turk- Aris 2010; Agoraki et al. 2011; Beck et al. 2013; Fu et al. 2014) support the competition–fragility hypothesis. Beck et al. (2013) study results suggest that an increase in competition is associated with a larger rise in bank fragility in countries with stricter activity restrictions, lower systemic fragility, better developed stock exchanges, more generous deposit insurance and more effective systems of credit information sharing.

Contrary to these empirical results, many studies (Uhde and Heimstoff 2009; Amidu and Wolfe 2013; Mirzaei et al. 2013; Cihak and Schaeck 2014) support the competition–stability hypothesis.

This hypothesis is confirmed by Čihák et al. (2013). They show that banks hold higher capital ratios in more competitive environments in the context of European banking. Amidu and Wolfe (2013) reach a similar conclusion in the case of developing and emerging countries.

Čihák and Schaeck (2014) suggest that efficiency is the conduit through which competition contributes to stability. Mirzaei et al.(2013) utilising data from 23 emerging economies and 17 Western European countries for 1929 banks over the period 1999 to 2008, evidence highlights that profitability and stability increase with an increased interest margin revenues in a less competitive environment for emerging economies.

There are other empirical studies (Berger et al. 2009; Tabak et al. 2012; Cubillas and Gonzalez, 2014) that provide mixed results and stress that the effect of competition on stability depends on institutional structures, capital market development, the economic environment and the stringency of regulation and supervisory standards.

Tabak et al. (2012) use bank data from 10 Latin American countries from 2003 to 2008 and find evidence that the relationship between competition and risk-taking is non-linear. That is, both high and low levels of competition significantly increase bank stability, while the opposite is true under moderate competition. Cubillas and González (2014) analyse the channels through which financial liberalisation affects bank risk-taking in an international sample of 4,333 banks in 83 countries, including Ghana, from 1991 – 2007. They conclude that

financial liberalisation increases bank risk-taking worldwide but through different channels depending on economic development or institutions.

Also, Moyo et al. (2014) using information on more than 600 banks in 16 SSA countries over the period 1995-2010, they document that banks are more stable in countries with competitive banking systems (higher level of H-statistic) but conclude that there is no clear-cut relationship between competition-stability and competition-fragility, as this is contingent on government pursuing sound macroeconomic policies and enhancing effectiveness of institutions to allow the banking sector to thrive.

3.4.3 CRITICAL REVIEW OF LITERATURE ON ENTRY AND BANK

STABILITY

Tables 3.3a – 3.3d present some empirical literature work on entry and bank stability. There is no academic consensus on whether bank competition leads to more or less financial soundness. Some studies support the competition-fragility view, while others find positive links between competition and bank stability (see Table 3.3a -3.3c). These studies differ in their samples and in the measures of competition employed. Channels whereby competition impacts bank soundness remain imperfectly known. Known theoretical models had focussed on closed economy set ups. The recent use of open economy through foreign loans and foreign direct investment to address the issue by Bremus(2015) can be seen in that light. The modelling of a bank's risk taking and leverage decisions explicitly in a framework with heterogeneous banks could allow for the shedding of light on the stability implications of international banking competition.

Table 3.3a Summary of Literature on Entry and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Uhde and Heimshoff (2009)	1997 -2005	25 European Countries	Random Effects Model and Two – Stage Least Squares(2SLS)	Z-score	National banking market concentration has a negative impact on European banks' financial soundness.	
Schaeck and Cihak (2010)	1995 -2005	3,325 banks from 10 European Countries	Fixed Effects and Two –Stage Least Squares(2SLS)	Z-Score	Competition robustly improves stability via the efficiency channel by reducing the likelihood of bank default and better quality asset. The aggregate level of non-performing loans, a possible proxy for systemic risk, is lower in competitive environments.	
Turk Ariss(2010)	1999-2005	821 banks from 60 Developing countries	Tobit Regression model and Two – Stage Least Squares(2SLS)	Z-Score	An increase in the degree of market power leads to greater bank stability and enhanced profit efficiency, despite significant cost efficiency losses.	
Agoraki et al.(2011)	1998-2005	13CEE Countries	System GMM	Z-index	Banks with market power tend to take on lower credit risk and have a lower probability of default.	
Amidu and Wolfe(2013)	2000 -2007	978 banks from 55 Developing Countries including 23 African countries	A Three-Stage-Least-squares (3SLS) simultaneous equation model	Z-Score	The results show a positive and significant relationship between competition and stability.	

Table 3.3b Summary of Literature on Entry and Bank Stability					
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results
Beck et al.(2013)	2005-2009	17,055 banks in 79 Countries	OLS and Two – Stage Least Squares(2SLS)	Z-Score	The effect of competition on stability depends critically on the market, regulatory and institutional framework in which banks operate.
Fu et al. (2014)	2003-2010	1,500 listed banks and 4069 unlisted banks from 14 Asia-Pacific	Instrumental variable technique with GMM estimator	Z-Score and Probability of Bankruptcy	Higher concentration enhances stability on one hand (concentration stability hypothesis) but reduces it on the other (concentration –fragility hypothesis) . The net effect of these two channels is ambiguous.
Moyo et al.(2014)	1995-2010	16 SSA Countries	Duration Model	CAMEL-type variables	The stability of the banking system in a liberalised and competitive economy is contingent on government pursuing sound macroeconomic policies and enhancing the effectiveness of institutions to allow the banking sector to thrive.

Table 3.3c: Summary of literature on Entry and Bank Stability with ambiguous or Non –linear Results					
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results
Berger et al .(2009)	1999-2005	8235 banks in 23 Industrialised countries	Instrumental variable technique with GMM estimator	Z-Score	Consistent with the competition-fragility view, banks with a higher degree of market power also have less overall with exposure. The data also provides some support for one element of the competition-stability view that market power increases loan portfolio risk. However, this risk may be offset in part by higher equity capital ratio.
Bretschger et al.(2012)	1970-2009	160 countries	Two –Stage Least Squares(2SLS)/R egressions and GMM	Binary variable of crisis and not having a crisis	There is no direct effect of market concentration on systemic crisis. However, the higher profitability of banks enhances the stability of the financial system, while a higher net interest margin exposes the system to an increased probability of a financial crisis. Higher concentration enhances stability on one hand(concentration stability hypothesis) but reduces it on the other(concentration –fragility hypothesis) . The net effect of these two channels is ambiguous.

Table 3.3d: Summary of literature on Entry and Bank Stability with ambiguous or Non –linear Results						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Tabak et al.(2012)	2003-2008	10 Latin American countries	OLS and 2SLS	Z-Score	The relationship between competition and risk-taking is non-linear. That is both high and low levels of competition significantly increase bank stability, while the opposite is true under moderate competition.	
Mirzaei et al.(2013)	1999-2008	1,929 banks 40 Emerging and Advanced Countries	GMM	Z-Score	The effect on market concentration on the Z-score is significantly negative in advanced economies, meaning that concentrated markets pose some risk. Concentration may induce incentives for banks to take-on more risk, supporting the 'concentration –fragility' hypothesis. This contrasts with the stabilising role of market share found for both emerging and advanced banks.	
Cubillas and González(2014)	1991-2007	4333 banks in 83 countries	Two –Stage Least Squares(2SLS) with Two –step system – GMM	Z-Score and Lerner Index	In developing countries ' financial liberalisation negatively impacts bank stability not as a result of competition, but by expanding opportunities to take risk. It is in economically and institutionally developed countries that financial liberalisation reduces bank stability through increases in bank competition.	
Source: Constructed from the Empirical Literature.						

3.5.0 BANKING RESOLUTION AND BANKING STABILITY

In almost all countries, bank regulation involves the provision of a government safety net for banks and their depositors. In fulfilling this task, Bagehot believed that the central bank should be guided by four main principles: (1) lend freely and to the public, (2) at a penalty rate, (3) to any actors with good collateral (4) who are illiquid but solvent. These principles, described in more detail below, constitute Bagehot's invaluable contribution to lender of last resort (LoLR) theory (Oganesyan 2013).

Thus, the traditional LoLR function has been modified as a result of the recent crisis, and the main features of the modern LoLR have been found to include provision of liquidity and collateral, lowering interest rates and expansionary monetary policy, loosening collateral standards, supporting critical institutions, opening special liquidity facilities that target specific markets or groups of agents, and becoming the market maker of last resort (MMLR) and buyer of last resort (BLR) (Nier 2009).

Carlson et al. (2015) argue that LOLR lending and liquidity regulations are complementary tools. Liquidity shortfalls can arise for two very different reasons based on liquidity and solvency concerns. For example, sound institutions can face runs or some deterioration in the liquidity of markets they depend on for funding. In addition, solvency concerns can cause creditors to pull away from troubled institutions. Using examples from the recent crisis, they argue that central bank lending is the best response in the former situation, while orderly resolution (by the institution as it gets through the problem on its own or via a controlled failure) is the best response in the second situation. They further

contend that liquidity regulations are needed in both situations as such regulations help ensure that the authorities will have time to assess the nature of the shortfall and arrange the appropriate response. Liquidity regulations also provide an incentive for banks to internalise the externalities associated with any liquidity risks(Carlson et al. 2015).

The next important component of government safety net is a deposit insurance scheme. Deposit insurance is generally considered an important part of the regulatory structure for the banking system. This structure should protect the “safety and soundness” of the banking system while providing banks with the appropriate rules and incentives to allocate credit and liquidity efficiently (Demirguc-Kunt et al. 2015).

3.5.1 THEORETICAL LITERATURE

The theoretical literature provides both positive and normative strands (Engineer 2013). A recent positive model of deposit insurance scheme is like the outcome of a non-co-operative policy game between nations (Engineer 2013). In this model, government can subsidise domestic banks through deposit insurance. This model assumes that depositors and government are rational actors. National governments choose the level of deposit insurance to maximise their citizen’s welfare, taking into account the endogenous behaviour of utility maximising depositors. The model ignores moral hazard issues and further assumes that entities are linked through international deposit flows. The inclusion of international competition for depositors generates a complex regulatory game, even though the model controls and excludes panic-based

bank runs which are contrary in standard normative models of insurance by Morrison and White (2011), where such subsidy are inefficient and are motivated by intergovernmental competition. Using a normative model, with both moral hazard and adverse selection, they show that government provided deposit insurance can act as an efficient subsidised recapitalisation.

The positive model therefore suggests that nations compete for deposits in order to protect their banking system from the destabilising impact of potential capital flight. Policies are chosen to attract depositors who optimally respond to the expected return to deposits, which depends on deposit insurance levels, systemic risks and transaction costs (Engineer 2013).

3.5.2 EMPIRICAL LITERATURE

While deposit insurance is aimed at ensuring depositor confidence and to prevent bank runs, it comes with an unintended consequence of encouraging banks to take on excessive risk (Demirguc-Kunt et al. 2015). Anginer et al.(2014) studied the relation between deposit insurance and bank risk and system fragility during the global financial crisis and the period preceding it. Using a sample of 4109 publicly traded banks in 96 countries they show that generous financial safety nets increase bank risk and systemic fragility in the years leading up to the crisis. They stress the importance of the underlying regulatory and institutional framework and lend support to the view that fostering the appropriate incentive framework is very important for ensuring systemic stability.

In line with this observation, Fonseca and González (2010) demonstrate using data for 1337 banks in 70 countries that capital buffers are higher in countries

with better accounting disclosure and less generous deposit insurance by strengthening market discipline and making charter value better able to reduce risk-taking incentives.

Other studies by (Angkinand and Wihlborg 2010; Forssbaeck 2011; Beltratti and Stulz 2012; Demirguc-Kunt et al.2015) point to the fact that the effect of deposit insurance on stability depends on scope, supervisory quality and government support.

However, the literature does not agree on insured deposit rates and runoffs in response to idiosyncratic institutional stress measures. While a few papers document some level of both increased rates and decreased quantities at struggling institutions, others fail to find such a result. The mixed results hold for both empirical studies and for case studies.

A recent study by Acharya and Mora (2012) also show using examples of US, German, Irish and British banks and their depositors, that banks were not as able to provide liquidity as would be implied by theory and evidence from other crises. Their findings show that when an aggregate shock risks the sovereign itself, the standard argument that banks function well as liquidity providers can fail due to the poor quality of deposit insurance. Furthermore, Imai and Takarabe (2011) found similar evidence of uninsured deposit outflows in Japan in 2002 as the government removed a blanket guarantee in favour of a cap. Following the removal of the guarantee, weak banks' uninsured time deposits fell and these banks were unable to compensate with increases in insured deposits, leading to a contraction in credit supply. Iyer and Puri (2012) find that

uninsured deposits run during stress events using data from India. Their finding is consistent with the other literature finding that these outflows are significantly greater for uninsured depositors.

3.5.3 CRITICAL REVIEW OF LITERATURE

Tables 3.4a and 3.4b present some empirical literature work on bank safety and bank stability. The literature on the impact of central banks of developing economies in sub-Saharan Africa not having the capacity to play the role required of a modern lender of last resort (LLR) is scarce. The literature shows that countries have explicit and implicit deposit insurance schemes. The adverse distributional effects of generous schemes underscored the strengths and weaknesses of different deposit insurance scheme features.

The literature does not show the transmission process through which the stability of the banking sector has been secured as a result of a country introducing a deposit insurance scheme. The literature shows largely post event effect of the deposit insurance protection schemes in various countries (Iyer and Puri 2012). The current coverage of deposit insurance remains above pre-crisis levels, raising concerns about implicit coverage and moral hazard going forward (Demirguc-Kunt et al. 2015).

Table 3.4a Summary of literature on Bank Resolution and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Angkinand and Wihlborg(2010)	1997-2003	52 countries consisting of 32 emerging, 16 industrial and 6 developing countries	OLS and Random Effects Models	Z-Score: Ratio of NPL/CAP and Standard deviation of NPL/ Capital (CAP)	The relationship between banks' risk taking and explicit deposit insurance coverage can be described as U-shaped.	
, Fonseca and González (2010)	1992-2002	1337 banks from 70 countries	GMM	Capital Buffer in Relative Terms	Better accounting disclosure and less generous deposit insurance, however, have a clear positive effect on capital buffers by both strengthening market discipline and making charter value better able to reduce risk-taking incentives.	
Forsbaeck (2011)	1995-2005	331 banks from 47 countries	Multiple Regression	Market Z-score	Deposit insurance reduces market discipline by the bank creditors and introduces a subsidy on increased risk, but the size of this subsidy depends on the agency cost structure of the bank, and therefore its ownership structure. Banks in countries undergoing a crisis are systematically riskier.	
Beltratti and Stulz(2012)	2007-2008	164 banks in 32 countries with assets above \$50 billion.	Multiple Regression	Z –Score	Though the existence of a formal deposit insurance scheme is associated with more idiosyncratic risk before the crisis, banks benefiting from such a scheme did not perform worse during the crisis.	

Table 3.4b Summary of literature on Bank Resolution and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Anginer et al. (2014)	2007-2009	4109 Banks in 96 Countries	OLS and 2SLS	Z-score and Marginal Expected Shortfall (MES)	In the 2007–2009 crisis period. Nevertheless, the overall effect of deposit insurance over the full sample studied remains negative since the destabilizing effect during normal times is greater in magnitude compared to the stabilizing effect during global turbulence.	
Demirguc-Kunt et al.(2015)	2013	188 countries	Univariate Analysis	Safety Net Index	They did not observe widespread bank runs. There were some notable exceptions (such as Northern Rock in the UK) and there were protracted withdrawals by uninsured depositors, but the world did not experience systemic bank runs by insured depositors. From this perspective, DIS delivered on its narrow objective of protecting depositors.	
Source: Constructed from the Empirical Literature.						

3.6.0 BANKING CORPORATE GOVERNANCE AND BANKING STABILITY

Bank governance refers to the implicit and explicit contractual relationships influencing the incentives of bank managers. In corporate governance literature it is usually assumed that managers in a good governance system maximise shareholders wealth while the incentives to serve the interest of other stakeholders are provided by market forces, law, and regulation (Angkinand and Wihlborg 2010).

The evidence on governance mechanisms includes boards, ownership structures, and executive compensation (De Haan and Vlahu 2013). Academic theory has long suggested a strong link between governance and risk-taking (Jensen and Meckling 1976).

The various ownership structures lead to differences in how the purposes of an organisation are shaped and how strategies are developed as well as the role and composition of boards (Johnson et al. (2011)). Johnson et al. (2011) suggest that there are two broad governance structures: the shareholder model and the stakeholder model.

The shareholder model is epitomised by the economies of the US and UK. The shareholders have legitimate primacy in relation to the wealth generated by the corporations, rather than the rights of other stakeholders such as employees, union representatives and financiers. However, proponents argue that maximising shareholder value benefits other stakeholders too (Johnston et al. 2011: 129-132). At least in principle, the trading of shares provides a regulatory mechanism for maximising shareholder value. Dissatisfied

shareholders may sell their shares, the result being a drop in share price and the threat of takeover for underperforming firms. So the shareholder interest in a company is assumed to be largely financial (Johnston et al. 2011: 129 -132).

The stakeholder model of governance is founded on the principle that wealth is created, captured and distributed by a variety of stakeholders. This may include shareholders but could include family holdings, and other investors. As such management is responsive to multiple stakeholders. Germany, Italy and Japan are often cited as examples of the stakeholder model (Johnston et al. 2011).

3.6.1 SHAREHOLDER VALUE (SHV) THEORY AND STAKEHOLDER VALUE (STV) MAXIMISATION THEORY AND BANKING STABILITY

Ferri and Leogrande(2015) classify banks depending on whether they follow a STV or a SHV maximisation model. Cooperative banks, savings banks, credit unions traditionally apply an STV maximisation model while commercial banks and non-banking financial intermediaries apply an SHV maximisation model as a strategy to maximise profits (Coco and Ferri 2010).

Academic literature on bank asset –side focuses on loans and credit commitments. Bank loans are considered to be special because banks monitor borrowers (Gorton 2009). Banks have private information about borrowers when they perform credit assessment of loans at the initiation of loan. This is signalled to the market in the decision to lend to the borrower.

Pecking order theory indicates that bank loans typically precede borrowing in the bond market for firms, thus banks are the first to certify a company as a

worthy borrower. The conclusion of academics is that bank loans will not be sold (Gorton 2009). This is because if loans are sold, the bank would have no reason to produce the private loan information or to monitor the borrower over the life of the loan.

This is the basis of the traditional originate –to- hold (OTH) strategy which signals that a bank is predisposed to a relationship banking model. This means also that OTH is the most appropriate credit management model for STV banks. The tendency to a correspondence between OTH and STV descends from the fact that heterogeneous stakes are guaranteed: i.e. shareholders and borrowers at least (Ferri and Leogrande 2015).

Shareholder theory focuses on shareholder value maximisation and adopts the originate-to- distribute (OTD) credit management model as against the originate –to-hold (OTH) credit management model (Ferri and Leogrande 2015). A major distinction between the two models hinges on the way they respectively influence the strategic management of the banks. According to Parmar et al. (2010) the stakeholder theory augments resource –based theory to provide the practical motivation for firms to act responsibly with regard to stakeholders interest, thereby addressing both the problem of value creation and trade and the problem of ethics of capitalism.

The STV-OTH banks have a long-run perspective, organise their resources to obtain long run goals, and at the same time can develop long-run relationships with non-shareholder constituencies. This underscores the higher resilience of STV-OTH banks to the crisis leading to three key differences which clearly stand out (Ferri and Leogrande 2015).

First, SHV-OTD banks cannot develop an efficient management to obtain long term goals since, as said, the structure of risks and the mechanism of building adequate capital reserves are falsified by the credit management model (Ferri et al. 2014).

Second, because the SHV-OTD focuses on the supply side, it creates incomplete contracts and markets. Banks that maximise SHV tend to use explicit credit contracts, evaluated on the basis of statistical analyses of risk, and often build collateralised contracts, via securitisation.

Third, in terms of efficiency, generally STV-OTH banks have a higher net interest margin (NIM) and lower Credit Deposit ratio (Caprio et al. 2014) and respect capital ratios via a more conservative management system. STV-OTH banks may be more sustainable (Coco and Ferri 2010). STV-OTH banks take less risk even in a pure accounting sense by checking borrowers' quality. In terms of risk and its impact of stability, the change from OTH to OTD and that from STV to SHV raised risks for the banking sector, financial markets and macro-financial stability.

3.6.2 AGENCY THEORY AND BANKING STABILITY

Banking literature on agency theory and stability follows a stand of literature which examines the nature of ownership relationships which give rise agency issues and how they impact on compensation and board structures.

Agency theory is the theory of the relationship between a principal e.g. a shareholder, and an agent of the principal e.g. a company's manager. An agency relationship may lead to some agency costs that are losses that arise

when an agent (e.g. a manager) does not act solely in the interest of the principal (Brealey et al. 2011:910). This will require that the principal takes measure to align its interest with the agents to achieve the expected results. So many factors influence the behaviour of the agent such as the monitoring of their activities, control of their decisions through the board, sanction for non-performance in place depending on both internal (from the shareholders) directly or indirectly through market discipline and regulation (Bai and Elyasiani, 2013).

3.6.3 THEORETICAL LITERATURE

Economists for a long time used to assume without question that players that make up modern corporations such as managers, employees, shareholders and bondholders acted for the common good but recent experience over the past 30 years show that there are conflicts of interests (Brealey et al. 2008:969). In addition, the property rights theory and legal approach to finance affirm that shareholders are the rightful owners of modern listed firms (Marcelin and Mathur 2015) whereas agency theory posits that managers are agents of shareholders (principals) that run the firm on their behalf (Brealey et al. 2011). However, banking literature on governance and bank stability (Bai and Elyasiani 2013; Dermine 2013) indicate that there are conflicts between shareholders and managers, where it is hypothesised that managers diverge shareholders interest and reduce and / or appropriate the shareholders' wealth unless there is alignment of reward which allow managers to share the gains from the risky projects with the shareholders. This is the well-known principal-agency problem within many firms (Jensen and Meckling 1976).

One means of aligning incentives between the two is to remunerate bank managers in equity. That has become a widespread practice during recent years, particularly within the financial sector. To take a striking example, in 2006 the typical bank CEO's wealth rose by \$1 million for every 1% increase in the value of their firm (Fahlenbrach and Stulz 2011).

Compensating managers in equity is not, however, without cost. By aligning managerial incentives with shareholders, the risk-shifting problem is potentially exacerbated. This includes incentives to "gamble for resurrection" when firms are nearing insolvency. Evidence during the crisis is revealing here. In short, in solving one principal/agent problem (between managers/shareholders), equity-based pay may have worsened another (between shareholders/debt-holders).

The second incentive argues Haldane (2012b) is that, the limited liability gives rise to a principal- agent problem between shareholders and debt-holders. And they are why double or even treble liability persisted in banking long after unlimited liability had been abolished (Haldane 2012b). The limited liability also leads to banker-depositor conflicts which have always caused excessive fragility in banking. Since banks' assets are often opaque, concerns about the quality of the assets can lead to panics and runs. Such concerns are less likely, however, if banks have significant equity funding from owners or shareholders, which allows them to continue to pay their debts and invest even after losses. In the nineteenth century, when banks in the UK were unlimited-liability partnerships, they routinely funded 50 percent of their investments by equity, and their owners' personal assets could be tapped to pay depositors (Haldane 2012b;

Admiti 2015). To reduce the likelihood of a costly run, a bank has an incentive to protect short-term depositors with a cushion of long-term securities such as equity or subordinated debt that can absorb losses as a going concern. The protection of short-term depositors is thus compatible with shareholder value maximisation (Dermine 2013).

The agency problems of banks are exacerbated by the presence of government guarantees and deposit insurance, which distort bankers' incentives and encourage risk-taking. In addition, the special role of banks and the negative externalities of their failure make banks' agency problems costlier for the economy (De Haan and Vlahu 2013).

A third incentives issue is moral hazard. In principle, if risk is shifted to debt-holders they ought to seek compensation through higher yields. That, in turn, would impose a degree of discipline on shareholder/manager incentives to risk-shift (Haldane 2012b).

However from the viewpoint of depositors, deposit insurers and regulators, for whom the stability of banks is the principal objective, providing bank managers with less equity-based compensation (EBC) is more desirable to prevent managers' incentives to adopt risky projects (Bai and Elyasiani 2013).

3.6.4 EMPIRICAL LITERATURE

The literature relating financial stability to the OTH model stressing that, banks can promote stability when they retain an STV-OTH model. In this case banks can stabilise the business cycle and also be instruments for economic growth,

while the structure of risks in the financial system can be controlled by regulatory reserves and this can help to stabilise the business cycle (Ferri et al. 2014). The empirical evidence supports the theory.

Empirical evidence on governance structure in relation to stakeholders and the shareholder model has been provided by Beltratti and Stulz(2012); Caprio et al.(2014); D'Apice et al.(2014);Ferri et al.(2014); and Lemzeri(2014). They point to the fact that SHV-OTH model banks are less susceptible to procyclicality and therefore are more stable. Beltratti and Stulz (2012) who examined 25 Asian banks from 2005 to 2009 show that banks with more shareholder-friendly governance performed worse during the crisis while Lemzeri (2014) who examined 15 co-operative banks and 49 joint-stock banks in Europe found that diversified cooperative banking groups that retained the main features of their original model (i.e., STV orientation) contributed most to financial stability throughout European national banking systems. Also, Ferri et al. (2014) who studied 4532 banks from 12 Euro area countries show that STV banks, especially cooperatives, were downgraded less than SHV banks by the credit rating agencies. In turn, on country level data, by augmenting Caprio et al. (2014) who studied 9,349 banks found that countries with larger cooperative bank shares in their national banking system less likely suffered the 2008 crisis. D'Apice et al. (2014) found that traditional banks were assigned better ratings through 2008-2009.

For instance, Ferri et al. (2013) found that STV banks, especially cooperative banks, showed no worse, and sometimes even better, performance than SHV banks before the recent financial crisis. Köhler (2015) compared the business

models and found that co-operative banks which engage in relationship lending can enhance their stability by financing their loans using core deposits which are unlikely to be withdrawn prematurely because they are held for liquidity services.

On agency theory, empirical studies by Bai and Elyasiani(2013)who examined 132 BHCs involving 216 CEOs from 1992-2008 found that the association between bank stability and managerial compensation is bidirectional. However, the empirical evidence on this, as part of the bank governance mix on financial stability is mixed. Angkinand and Wihlborg(2010); DeYoung et al.(2013); and Cheng et al.(2015) examined the relationship between the impact of high-powered remuneration and stakeholder control and found that high-powered remuneration aligns the incentives of shareholders and managers and leads to higher profitability , but may have unintended effects on banks. DeYoung et al.(2013) found that CEO risk-taking incentives lead to riskier business policy decisions (regarding loans to business, non-interest based banking activities, and investment in mortgage-backed) at US commercial banks over the 1994 - 2006 period, especially in the second half of the period after deregulation. In contrast, Fahlenbrach and Stulz(2011) found some evidence that US banks with CEOs whose incentives were better aligned with the interests of shareholders in 2006 had a worse share price performance during the subsequent crisis. The literature confirms that high-powered remuneration led banks to take more risk and then suffer losses during the recent crisis.

Saghi-Zedek and Tarazi(2015) and Berger et al.(2012) examined how ownership structure impacts on performance and default probabilities of banks

respectively. Both findings support the view that ownership structure does matter in explaining cross-variation in bank performance and default probabilities respectively. Saghi-Zedek and Tarazi (2015) studied 750 commercial banks based in 17 western counties between 2002 and 2010 and found that shareholders with excess control rights positively impacted on profitability and risks. Berger et al.(2012) examined 249 default and 4,021 no default US commercial banks between 2007 and 2010 and found that where the shareholding of a bank has fewer outsider director and chief officer shareholding and more of other corporate insiders shareholding notably lower – level managers, such as vice presidents or departmental heads, are more likely to default, indicating the importance the ownership structure plays in explaining the default likelihood. They argue that lower-level managers with large shares may take on more risk because of the moral hazard problem. Outside directors and chief officers are vilified in the event of default, so that the moral hazard problem may not apply as much to them. This finding supports the current regulation on compensation (Fullenkamp 2013).

3.6.5 CRITICAL REVIEW OF LITERATURE ON GOVERNANCE MODEL AND BANK STABILITY

Tables 3.5a – 3.5c present some empirical literature work on bank governance and bank stability. The literature does not analyse the impact of Basel III on the governance models notably that of STV banks. The study is also skewed towards big banks, notably the BHCs that pursue a SHV model of governance.

It is possible that the relationship between corporate governance mechanisms and systemic risk is induced and is different in more normal financial conditions.

Given that corporate governance structure changes slowly, a longer sample period would also allow for the analysis of whether changes in governance mechanisms affect systemic risks. Again the literature is silent on how the various roles of board members affect bank stability. Furthermore, the literature is largely limited to bank performance with few examining how and through which channel specific governance structures and observable board characteristics influence bank stability and the systemic risk of financial institutions, particularly in sub-Saharan Africa.

Table 3.5a Summary of literature on Corporate Governance and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Angkinand and Wihlborg(2010)	1997-2003	52 countries consisting of 32 emerging, 16 industrial and 6 developing countries	Z-Score; Ratio of NPL/CAP and Standard deviation of NPL/ Capital (CAP)	Z-score	Countries with stronger shareholder rights have a lower level of non-performing loans relative to capital. This effect is particularly strong in countries with low explicit deposit protection and presumably relatively high risk shifting incentives caused by high implicit protection.	
Fahlenbrach and Stulz(2011)	1994-2006	95 USA Banks	Cross-sectional Regression	Equity Risk	They found no evidence that banks with CEOs whose incentives were less well aligned with the interests of their shareholders performed worse during the crisis.	
Beltratti and Stulz(2012)	2005-2009	25 Asian Banks	OLS and 2SLS	Z-score and Volatility change in Equity	They find that poor bank governance was a major cause of the crisis because banks with more shareholder- friendly boards performed significantly worse during the crisis than other banks.	
Berger et al.(2012)	2007-2010	249 default and 4,021 no default US commercial banks	Probit Regression model	Bank Accounting Variables including Capital Ratio and NPL Ratio etc.	That a bank's ownership structure plays a substantial role in explaining default likelihood: banks are more likely to default if they have fewer outside director and chief officer shareholdings and more shareholdings of other corporate insiders.	

Table 3.5b Summary of literature on Corporate Governance and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Bai and Elyasiani(2013)	1992-2008	S & P 1500 132 BHCs involving 216 CEOs.	System –based Model	Z-score	The association between bank stability and managerial compensation is bi-directional: higher vegas (CEOs compensation packages) induce greater risk and vice versa. Higher vegas lead to greater bank instability. Bank stability is	
Caprio et al. (2014)	1998-2008	83 countries from OECD as well as Non-OECD and developing countries	Probit Models	Systemic crisis or borderline crisis and Z Score	Their evidence suggests that a more traditional banking system (Originate –to Hold (OTH))had a lower probability to be in crisis in 2008. Thus, a return to an old style banking i.e. (OTH).	
D'Apice et al.(2014)	2006-2009	241 listed banks from Europe , Asia and America	OLS and Fixed Effects models	CAMELS variables	Stakeholder banks have better performance rating than their shareholder counterparts.	
Ferri et al. (2014)	1999-2011	4532 banks from 12 Euro area countries	GMM	Loans	Shareholder banks seem to follow less procyclical lending policies , as they reduced lending supply to a lesser extent (or made no reduction in some cases) following an increase in interest rates than shareholder banks .	

Table 3.5c Summary of literature on Corporate Governance and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Lemzeri (2014)	2001 -2011	15 Co-operative banks and 49 joint stock banks	Panel data Model : Random -Effects Model	Z-score ROE Loans	Cooperative banking groups that have an intermediate hybridisation degree contribute more to financial stability than the joint-stock banks.	
Cheng et al.(2015)	1992-2008	632 financial institutions	OLS	ROA, Asset Turnover ;and Total Factor Productivity(TFP)	Compensation is positively correlated with both risk and current productivity.	
Iqbal et al. (2015)	2005-2010	71 USA Financial Institutions	Fixed –Effects Panel Regression	Marginal Expected Shortfall (MES) and systemic risk (SRISK)	Financial institutions with stronger corporate governance mechanisms and more shareholder-friendly boards are associated with higher levels of systemic risks	
Saghi-Zedek and Tarazi(2015)	2002-2010	750 Commercial Banks based in 17 Western Countries	Generalised Method of Moments (GMM).	Z-score	Ownership structure does matter in explaining cross-variation in bank performance during the 2007-2008 financial crisis as shareholders with excess control rights negatively impacted on profitability and positively impacted on risk during the 2009-2010 period.	
Source: Constructed from the Empirical Literature.						

3.7.0 BANK ACCOUNTING, MONITORING AND BANKING STABILITY

Banking supervision, regulatory reporting requirements and key supervisory ratios such as the CAMELS variables, Basel III risk adjusted capital, liquidity and leverage ratios are to a great extent based on accounting data and measures. These measures range from simple book measures based on bank-level bottom –line accounting numbers, such as leverage ratio, to sophisticated market or book measures based on a portfolio-level model, such as value at risk (Acharya and Ryan 2015). Therefore, the effectiveness of banking supervision is influenced by the choice of accounting framework on the part of the banks supervised (Schwartz et al. 2014).

Banks take on risks that are opaque and difficult to verify (Bushman 2014). Financial statements not only record the financial situation of a reporting entity, they also influence its management and investor decisions. Consequently, financial statements and accounting rules influence the level of bank risk taking indicated by the level of lending and loan loss provisioning behaviour, which may in turn have an effect on financial or banking system stability (Schwartz et al. 2014). The role of managerial discretion over accounting decisions influence bank stability through two accounting channels: accounting numbers as numerical quantities and bank transparency (Bushman 2014).

Bank transparency is defined as the availability to outside stakeholders of relevant, reliable information about the periodic performance, financial position, business model, governance, value, and risks of banks (Bushman 2014).

Bushman (2014) again stresses that financial accounting is a powerful point of

entry for empirical investigation into the economic consequences of bank transparency. Ratnovski (2013) had earlier defined transparency as a set of ex-ante choices that determine the presence of credible communication channels, with the key cost of transparency being lower benefits of control. This definition distinguishes transparency from disclosure which is an ex-post action and therefore regulation of disclosure is not sufficient to achieve transparency when banks can manipulate or obfuscate information especially in the period of liquidity crisis, since a distressed firm has high incentives to manipulate information. On the contrary, Huang and Ratnovski(2011) also provide evidence that although transparency renders banks unable to conceal negative but not the possibly of incorrect news about solvency. Therefore, the emphasis on verifiable outcomes produces a rich set of variables that support a wide range of enforceable contractual arrangements and that form the basis for outsiders to monitor and discipline the actions and statements of insiders (Basel Committee 2015). Again the variable outcomes are central to the efficacy of market discipline and non-market mechanisms in limiting the debt and risk overhang problems (Acharya and Ryan 2015:4).

An area of transparency relates to impairment. A well-functioning impairment model is of paramount importance for an amortised cost measurement to be reliable and credible (Hoogervorst 2012). Transparency is therefore a necessary precondition of stability (Hoogervorst 2012).

3.7.1 THEORETICAL LITERATURE

The theoretical literature on accounting and bank stability follows from the bank capital crunch theory which expresses the need to mitigate pro-cyclical features of capital regulations partly caused by capital regulation accounting rules and standards. These capital regulation accounting rules and standards are therefore important elements in enhancing the stability of the financial system (Schwartz et al. 2014). Bank capital crunch theory recognises the pro-cyclical provisioning hypothesis and fair valuation method in accounting as drivers. Pro-cyclicality is the exaggeration of cyclical tendencies in aggregate economic activity (Beatty and Liao 2011).

Capital crunch theory predicts that capital adequacy regulation combined with market imperfections leads to pro-cyclical bank lending. Specifically, banks reduce lending more to avoid potential future violations of regulatory capital minimums during recessions relative to expansions (Beatty and Liao 2011). Since banks have to hold capital against the risks inherent in their operations, they may then be forced to reduce lending or sell assets. In economic booms these effects reverse such that banks may further expand lending or buy assets (Beatty and Liao 2014).

Regulators and policymakers argue that current loan loss provisioning rules under International Accounting Standard 39 Financial Instruments: Recognition and Measurement (IAS 39), reinforce the pro-cyclical capital effect through its fair value measurement and impairment rules. At the bank level, it provides room for delayed recognition of losses, which also can lead to higher cost of equity financing, availability of credit funding and terms demanded by creditors

to supply such funds (Ratnovski 2013; Archarya and Ryan 2015). Delayed recognition of expected loss is associated with higher stock market illiquidity and a higher correlation between bank-level illiquidity and aggregate bank sector illiquidity and market returns during recessions (Beatty and Liao 2011; Bushman and Williams 2014).

A forward looking loan provisioning under IFRS 9: Financial Instruments (Schwartz et al. 2014) is supported by regulators given these macro-economic concerns with the current incurred-loss provisioning method (Beatty and Liao 2011). It is a mixed measurement model (Hoogervorst 2012). In IFRS 9, financial instruments that have basic loan features and are managed on a contractual yield basis are measured at amortised cost. In contrast to the incurred loss model, the so-called “expected loss model” under IFRS 9 – Financial Instruments, implements a forward-looking methodology. Under this model, impairments can be made in a timelier manner, potentially dampening pro-cyclicality. Pro-cyclicality in bank lending may arise from the immediate and excessive recognition of losses in economic downturns, leading to a reduction in the capital base of banks (Beatty and Liao 2014). Credit losses that are expected to occur are reflected over the life span of credits, providing useful information for investors.

According to IFRS 13, fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Using fair values to value banks assets and liabilities have the benefits of reflecting current market conditions and

providing timely information (Schwartz et al. 2014). Fair value accounting was intended to increase transparency and thus reinforce disciplining effects imposed by the markets. The excessive use of fair value measurement can theoretically, affect the stability of banks because it can introduce unintended volatility and procyclicality, thus requiring some enhancements (Scalata et al. 2008).

In contrast, Acharya and Ryan (2015) recently provide four a-prior strong reasons that exist to suggest that fair value accounting has had relatively minor effects on capital and thus stability to date. The four reasons are as follows: (i) banks primary types of financial instruments (loans and deposits) are measured at amortised cost and not fair value; (ii) the definition of fair value does not mention fire sale, thereby reducing the effect of market liquidity on fair value estimates; (iii) regulatory filters exclude unrealised gains and losses particularly on available for sale (AFS) debt securities that bank's only commonly hold and generally recognised them at fair value; and (iv) gains and losses on low –credit risk debt instruments have counter-cyclical effects on regulatory capital (Xie 2015).

Among others, Scalata et al. (2008) have concluded that despite the problems encountered with fair value accounting, it is still the most appropriate way of valuing financial instruments.

3.7.2 EMPIRICAL LITERATURE

Some positive evidence from empirical studies (Jarolim and Öppinger 2012; Beatty and Liao 2011, 2014) find that the accounting rules did indeed have a significant effect on banks' income statements and may thus have exacerbated the impact of the crisis. Jarolim and Öppinger (2012) empirically analysed the reaction of the European banking sector to the aforementioned amendments to the rules on reclassification of financial assets from October 2008 by focusing on 52 of the 80 banks included in the STOXX® Europe TMI Banks index. They show that this reclassification option was used quite extensively by some banks and, on average, it avoided recognition of accounting losses of almost €900 million per bank. The study reveals that banks could have run into substantial problems if the rules had not been amended at the peak of the crisis.

Beatty and Liao (2011) consistent with the capital crunch hypothesis, find a higher association between lending and risk-based capital ratios during recessions. They also find a stronger capital crunch effect for banks with assets greater than \$500million. Consistent with the pro-cyclical provisioning hypothesis they further observe a greater reduction in lending during recessions by banks that delay expected loss recognition more compared with banks that delay less. Additionally, they find that the smaller delay banks demonstrate less association between capital and lending. These results hold for both the loan loss specific market measures and management quality partitions. Furthermore, they find that smaller delay banks increase their pre- provision equity more during expansions and that greater delay banks' pre-provision equity is reduced

more during recessions. Finally, they found no evidence of a capital crunch during the pre-regulatory period.

Contrary to the above, Georgescu and Laux (2013) find that three prominent German banking failures involved banks that were regulated using data based on historical costs. They in addition, argue that policy-makers should reject the notion that historical cost accounting would be more suitable for promoting financial stability in the future.

Some recent research by Bushman and Williams (2012) and El Sood (2012) also failed to find clear empirical evidence that fair value accounting caused or significantly worsened the crisis. Bushman and Williams (2012) examined banks across 27 countries and found that discretionary forward-looking provisioning can also be used to smooth or disguise earnings. This could weaken market discipline, as transparency and comparability of financial statements may then be reduced.

El Sood (2012) using a sample of 878 US bank holding companies over the period 2001–2009, and a multivariate regression model, find strong evidence of income smoothing behaviour. Comparing the pre-crisis boom of 2002–2006 with the crisis period of 2007–2009, he finds that banks use loan loss provisions more extensively during the crisis period to smooth income upward.

Other empirical research findings provide mixed results (Fillat and Montorial-Garriga 2010; Chan-Lau 2012; Fernández de Lis and García- Herrero 2013). Fernández de Lis and García- Herrero (2013) found that the Spanish

provisioning model reduced pro-cyclicality but did not eliminate it. Meanwhile, Fillat and Montorial-Garriga (2010) analyse the effects that the Spanish provisioning model would have had on 13 US banks that accessed the Troubled Asset Relief Program (TARP) Funds during the crisis. In this hypothetical situation, about half of the US banks that received government support would not have required it. However, the provisions would not have been enough to cover all losses incurred, suggesting that the Spanish model is a good way of covering losses in “average” downturn periods, but would not suffice for a financial crisis that is as severe as the most recent one.

Chan-Lau (2012) in a simulation exercise applied to the Chilean banking sector, also found that while dynamic provisioning increases the resilience of banks it may not dampen pro-cyclicality. Therefore, dynamic provisioning might not be effective for dampening pro-cyclical effects in all jurisdictions and policy makers should not rely solely on this approach to solve the problems encountered during a crisis. Instead, Chan-Lau (2012) recommends that additional counter-cyclical measures, such as the regulatory buffers proposed by the Basel III regime, should be considered.

Therefore, rules to limit the excessive use of fair value measurement are promoted by both the academic literature and regulatory and financial sector policy makers to prevent artificial increases in the volatility of profit and loss accounts that may exacerbate pro-cyclicality and undermine the resilience of the financial system (Schwartz et al. 2014).

3.7.3 CRITIQUE OF LITERATURE ON ACCOUNTING AND BANK

STABILITY

Tables 3.6a and 3.6b show the summary of literature on accounting and bank stability. Accounting rules can make a substantial difference to supervisory ratios, impeding the international comparability of key metrics required in the supervision process (Schwartz et al. 2014; Bushman and Landsman 2012). Lack of uniformity makes comparability of key accounting variables between bank financial results with varying accounting standards as against that using USA and IFRS GAPS an issue of concern for policy formulation (Schwartz et al. 2014).

Another drawback is that the pricing of non-marketable instruments or of assets with illiquid markets as in many developing countries is based on models and assumptions, leaving considerable discretion to banks vis-à-vis the measurement of their assets. This increases opaqueness and reduces the comparability of financial statements (Bushman 2012; Acharya and Ryan 2015).

Table 3.6a Summary of literature on Accounting, Monitoring and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Fillat and Montoriel-Garriga (2010)	2000-2009	13 USA Banks that received TAAP funds	Hypothetical Dynamic Provisioning Model	Loan Loss Provision(LLP)	Half of these banks would not have needed the TARP funds had the dynamic provisioning system been in place.	
Beatty and Liao(2011)	1993-2009	1370 Banks	OLS	Loan Loss Provision (LLP)	Consistent with capital crunch hypothesis, there is a higher association between lending and risk –based capital, particularly for banks with assets greater than 500million.	
Bushman and Williams(2012)	1995 - 2006	3091 Banks from 27 countries	OLS	Loan Loss Provision(LLP)	Forward-looking provisioning designed to smooth earnings dampens discipline over risk-taking, consistent with diminished transparency inhibiting outside monitoring.	
Chan-Lau(2012)	2004-2010	14 Chilean Banks	Simulation Analysis	Loan Loss Provision (LLP)	Dynamic provisioning increases the resilience of banks but may not dampen pro-cyclicality in all jurisdictions.	

Table 3.6b Summary of Literature on Accounting , Monitoring and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
EI Sood(2012)	2001-2009	878 USA Banks	Multivariate Regression Model	Loan Loss Provision (LLP)	Bank holding companies accelerate loan loss provisions to smooth income when (1) banks hit the regulatory minimum target, (2) are in non-recessionary periods, and (3) are more profitable. Bank internally set regulatory capital ratios are relatively more significant than regulatory-set ratios to trigger income smoothing behaviour using loan loss provisions.	
Beatty and Liao (2014)	1993-2012	1394 Banks	Factor Analysis and OLS	Loan Loss Provision (LLP)	High correlation between discretion in charge –offs and discretion in loan loss provisions.	
Source: Constructed from the Empirical Literature.						

3.8.0 SUMMARY OF PRIOR RESEARCH AND GAPS IN THE LITERATURE

Regarding the study on the relationship between regulatory structures and bank –level stability, the literature shows that researchers (King 2013; Beatty and Liao 2014; Cullibas and Gonzalez 2014; Hong et al. 2014; Dermine 2015; among several others) make use of: (i) different approaches, assumptions and methods; (ii) variables and measures of bank entry, exit, accounting, supervisory and prudential measures and bank stability; (iii) control and instrumental variables and their measures or proxies; (iv) block study categories (developed, developing countries; low income, middle and high income economies, OECD among others); (v) time horizon or periods for the sample data, and (vi) data types (cross-sectional or panel) among other things. The differences in the choices made might explain the mixed results and ambiguous conclusions in the existing empirical works.

Hence, the important question for research is: why is the empirical evidence mixed or ambiguous? This question triggers the following discussion that would reveal the vital differences that this research would try its best to accommodate by following or extending some of the previous studies that would make it different from them.

Firstly, many of the past studies try to analyse the effect of only one (King 2013) or certain country category (ECB 2014; Demirguc-Kunt and Detrigiache 2015). For instance, Lemzeri (2014) made their studies on stability of banks using Z-score, ROE and Loans as proxies and the governance adopted using co-operative and joint stock banks to ascertain the effect of SHV-OTD and STV-OTH. Likewise, some of the studies focusing on accounting rules governing

how a wide range of complex transactions are mapped into accounting numbers, indicate that poor mapping between fundamental activities and accounting numbers can introduce significant noise into banks' financial statements. For example, Beatty and Liao (2014), show that on average only 20% of assets are recognised at fair value in bank balance sheet in the USA as at December 31 of 2012. This example is extremely helpful as it draws our attention to the need to assess the direct impact of a country's characteristics on stability. This research will therefore take into account the characteristics of the Ghanaian banking system and practices in the discussion of the research findings resulting from the univariate and regression analysis.

The use of different measures of stability and the omission of some relevant variables might contribute to the difference in the results and ambiguity of conclusions. Hence, considering this and following Chiaramonte et al.(2015) and Lepetit and Strobel (2015) the empirical analysis would involve a comparison of the CAMELS and Z-scores at bank individual risk-taking levels in order to fill the gap of exclusion bias as mentioned in Chapter 2, section 2.5. Again, because the Z-scores of the sample selected in the existing literature on average were not representative enough of Ghana's bank stability figure, this research will make it more representative.

Hence, unlike the previous studies, the composite CAMEL score and that of the Z-score will be estimated and compared to ascertain if they offer the same results or otherwise. More importantly outcomes that offer a more downside risk will be studied further to ascertain empirically, if the drivers impact significantly or not on the banking stability.

Secondly, a literature search showed different studies that used the Z-score did not set an index or thresholds for the Z-score but only described it as an indicator for distance to default. Again, several of the related studies which extend into systemic stability use market related figures as against accounting data which makes them inapplicable in this research as most of the banks are not on the stock market. In this research, following that of Klomp and De Haan(2012), Chiaramonte et al. (2015) and Lepetit and Strobel(2015) accounting data which complies with the IFRS and Basel III, Prompt Corrective Action (PCA) requirements will be used to measure and establish the relationship between the systemic risk variables and banking stability.

Finally, the empirical analysis will also use several estimation procedures to investigate the relationship between the stability score and the bank-level and regulatory variables. Hence, the procedures to be used are: (1) different types of robust regressions besides the OLS for primary analysis and (2) fixed effects and random effects regressions. A diagnostic analysis will be undertaken to check the consistency of the results or evidence and to handle some characteristics of the sample data including issues of heteroskedasticity, multicollinearity and autocorrelation, which violate the OLS assumptions. Such violations will necessitate the use of other estimation methods when using panel data (Apergis 2015).

To sum up, this research would fill the gap in the literature by accounting for some of the sources of differences in results or include variables that the existing literature on bank stability in Ghana had excluded. These sources are: (1) use of composite instead of single component of CAMELS and Z-scores as

stability measures; (2) use of a lower threshold or level of assets which will accommodate the relevant banks in Ghana as indicated in chapter 2, section 2.5; (3) include relevant variables such as interbank borrowing, risk governance and regulatory independence of banks in the estimation procedures as drivers of stability in the literature on Ghana in chapter 2, section 2.5; and (4) use of different estimation procedures for primary analysis and for sensitivity and consistency analysis.

CHAPTER 4

RESEARCH PHILOSOPHY AND HYPOTHESIS DEVELOPMENT

4.1 INTRODUCTION

This chapter examines and justifies the appropriate research paradigm and the associated elements guiding this study. It seeks to achieve three additional objectives. First, is to develop the conceptual framework which shows the relationship between bank regulation and stability theories and bank-level risk taking activities. Second, is to critically examine the literature to understand the causal relationship that had been established theoretically and empirically between the gaps identified in the literature review in chapters 2 and 3 which included foreign ownership and participation, bank size, interbank borrowing and debts, NPL, risk governance and regulatory independence and bank stability. Third, is to formulate the research hypotheses.

4.2 RESEARCH PHILOSOPHY

A clear research philosophy is of central importance to the efficient conduct of any research project. Among other things, it provides a basis for the methodological framework, the validity and legitimacy of the research. The researcher's philosophical view, therefore, informs and guides the whole research process. A review of the literature on research methodology and philosophies show that there are several ways in which the various paradigms have been classified. However, the various classifications can be seen as variations that lie in between two extreme points, the positivist view and the interpretivist view.

Collis and Hussey (2013) support the view that paradigm can be used at philosophical, social and technical levels. While the philosophical level reflects the basic belief about the world, the social level reflects how the research should be conducted. The technical level, however, specifies the methods and techniques that should be adopted when conducting research. The positivist paradigm posits that the social world exists externally, and that its properties should be measured through objective methods (Easterby-Smith et al. 2015). The positivists paradigm approach is usually quantitative, and characterised as being objective, scientific and traditionalists (Collis and Hussey 2013). In contrast, the interpretivist paradigm rests on the assumption that social reality is in the mind of the researcher. This paradigm is also characterised as being subjective because it is socially constructed and with each researcher having his or her own sense of reality, and there are multiple social realities (Collis and Hussey 2013).

According to Easterby-Smith et al. (2015) the main strengths of the positivist paradigm are that they can provide a wide coverage of situations, fast and economical. And because most data are aggregated from large samples, they may be of considerable relevance to policy. They further argue that the positivist paradigm provides room for the researcher to focus on hard data rather than opinion, look for regularities in the data obtained; and allows for a proposition that can be generalised from a specific example to a wider population of organisations and situations. On the contrary, researchers critical to positivism argue that rich insights into this complex world are lost if such complexity is reduced entirely to a series of law-like generalisation (Saunders et

al. 2016). Easterby–Smith et al. (2015) further discuss the limitations of positivisms as being inflexible and artificial and, in particular, not very helpful in generating theories. They further argue that much of the data gathered may not be relevant to real decisions even though it can still be used to support the covert goals of decision makers.

Interpretivism, on the other hand, has the benefit of allowing the researcher to focus on exploring the complexity of social phenomena with the view of gaining interpretative understanding (Easterby- Smith et al. 2015). According to Saunders et al. (2016) interpretivism is the heritage of the two intellectual traditions of phenomenology and symbolic interactionism. The use of qualitative methods is fairly complementary.

The main limitation is that beliefs determine what counts as facts. In between these two extremes are other alternative research paradigms, such as critical theory, feminism, hermeneutics, postmodernism and pragmatism theory which also represent relatively coherent ways of thinking which is promoted by influential proponents (Easterby-Smith et al. 2015).

This study adopts a positivist paradigm since it seeks to investigate a phenomenon that can be said to be deterministic. Because the regulatory actions and financial stability measures are determined by law and are exact to an individual bank, a deterministic approach can be used to estimate the expected relationships. The data required for this research either already exist in various forms or can be computed from existing data. This study also proposes a number of hypotheses based on existing theories and the literature and tests these hypotheses empirically using quantitative data gathered across

banks and across time. Finally, the results obtained from the analysis of this data can be easily replicated.

4.3 RESEARCH APPROACH

The research approach is deductive. The main body is exploratory and therefore the focus is on getting insights and familiarity with the subject area for more rigorous analyses (Collis and Hussey 2013). The research adopts the five sequential stages through which deductive research will progress: deducing a hypothesis from theory; expressing the hypothesis in operational terms; testing the operational hypothesis; examining the specific outcome of the inquiry; and finally, if necessary, modifying the theory (Saunders et al. 2016).

4.4 DEVELOPMENT OF A CONCEPTUAL FRAMEWORK

The conceptual framework (Figure 4.1) illustrates the link between regulation and the operationalisation and measurement of bank safety and soundness. Banking regulation is dynamic, and in this conceptual framework liberalisation is a dynamic process which responds to changing domestic, global economic and international regulatory changes.

Liberalisation therefore affects the existing regulatory design and structure which the underlying theories require a systematic approach to its sequencing in the form of: product and market development; risk mitigation; associated infrastructure; and capital account management. Gallagher et al. (2014) and Reinhart and Rogoff(2009) in the literature on capital account liberalisation and financial stability show that there appears to be an association between capital

account liberalisation and the incidence of financial crisis. Therefore capital account management measures that are sequenced with other economic reforms and regulations in order to maintain economic growth, productive employment, social cohesion and financial stability become extremely important (IMF 2015b).

The structural impact of liberalisation on banking system stability therefore follows from the entry of foreign banks; increased competition domestically; the inflow of foreign capital, their nature and sources; new products; and risk management practices and technology (Cubillas and González 2014). Important regulatory measures to mitigate the risks inherent in the liberalisation process are the existence of financial monitoring and supervision and the need to keep pace with the financial reforms (Karacadag et al. 2003).

Financial monitoring and supervision are the day-to-day and continuous process of monitoring financial institutions to avoid potential bank failures and systemic risks from any of the financial institutions being supervised or from any related external sources. A bank's compliance with regulatory standards and achievement of good financial performance are indications of its ability to survive in the given economic and political situation (Barth et al. 2013).

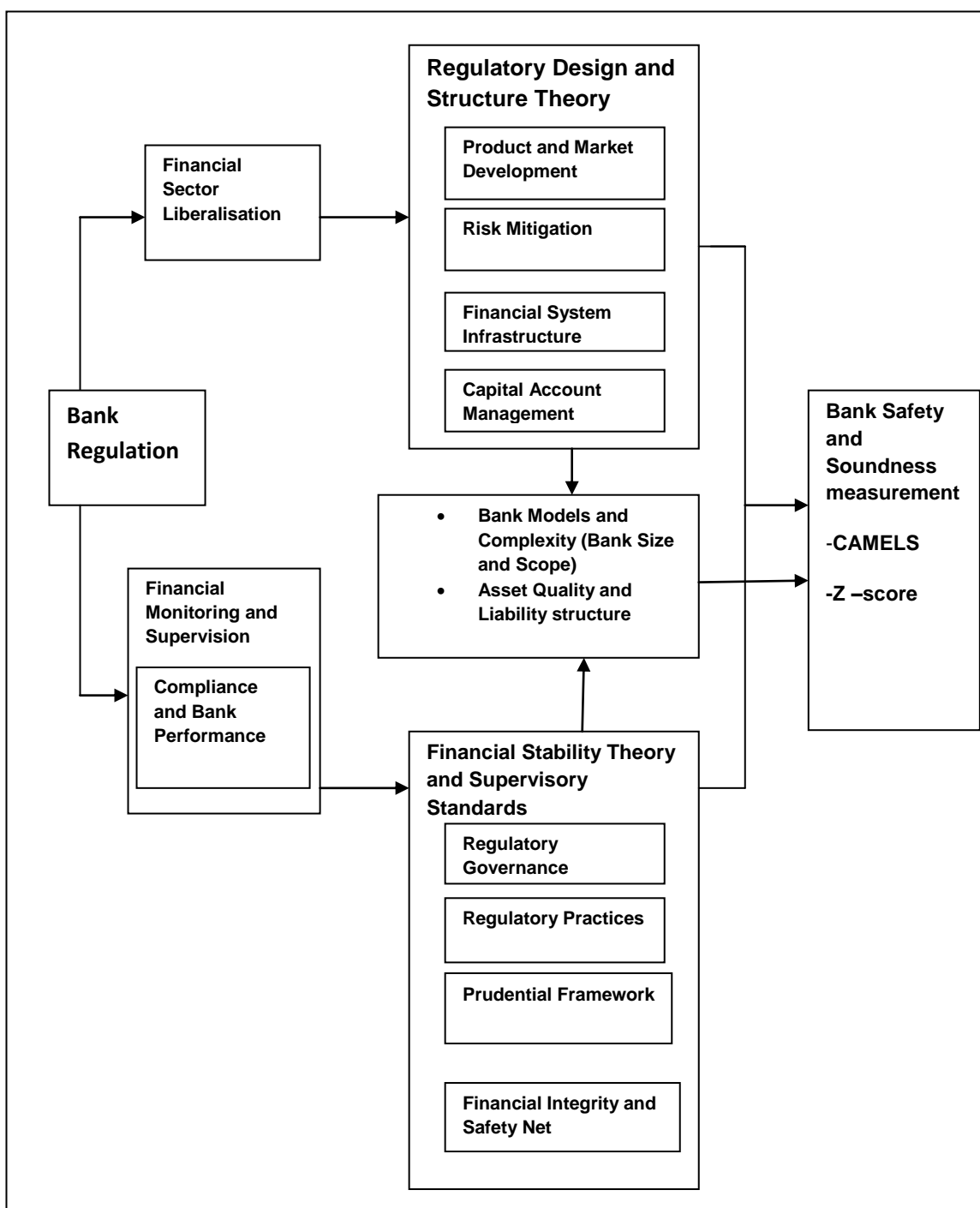
The financial stability theory has within its foundation the supervisory standards. These standards consist of a set of core principles that can be grouped into four core components: (i) regulatory governance; (ii) regulatory practices; (iii) prudential framework, and (iv) financial integrity and safety net. The regulatory design and structure and supervisory standards are interrelated and they

influence each other. They combine to determine the banking models, strategies and complexity of banking activities in a jurisdiction (Karacadag et al. 2003).

Again, these standards affect the size of banks, asset quality and liability structures of banks being supervised in a jurisdiction. The conceptual framework therefore serves as the foundation of the research hypotheses.

Figure 4.1

Conceptual Framework: Regulatory Structures, Bank-level Risk Management and Bank Stability



Source: Author's Illustration: Adapted from Karacadeg et al. (2003) Framework on sequencing of banking sector liberalisation and modified by Author.

4.5 HYPOTHESIS DEVELOPMENT

This section examines the various hypotheses proposed and then tested in this research. The link between the regulatory structure and bank system stability and other perspectives discussed in Chapter 3 (Literature Review) is used to develop the testable hypotheses for this study. This takes into account the influences of globalisation of financial services on the regulatory framework and its design. Six testable hypotheses are proposed based on the regulatory structure and financial stability theories.

4.6 BANK SIZE AND BANK STABILITY

It has been suggested in banking literature that size is important in explaining the stability of any bank. Demirgüç-Kunt and Huizinga (2011) distinguish between a bank's absolute size and its systemic size which is the size of the bank relative to the national economy. In practice, a bank determines its absolute and systemic size jointly, if it remains established in the same country. They argue that while absolute size presents banks with a trade-off between risk and return, systemic size is an unmitigated bad, reducing return on assets without a reduction in risk. In other words, a bank's assets size determines the bank's potential impact on the banking system should they fail (BOE 2009). The share of a bank's assets over total banking system assets is also used to measure its market power within the loan market of the country. Claessens and Van Horen (2012) argue that differences between small and large banks are driven in part by different economies of scale and the fact that such banks operate in different niches, leading to differences in performance.

4.6.1 THEORETICAL LITERATURE

There are several theories supporting the view that large and complex banks contribute to systemic risk. According to one view, the unstable banking hypothesis, large banks tend to engage more in risky activities (e.g., trading) and be financed more with short-term debt, which makes them more vulnerable to generalised liquidity shocks and market failures such as liquidity shortages and fire sales (BOE, 2009; Giesie et al. 2013).

According to another view, the too-big-to-fail hypothesis, regulators are reluctant to close or unwind large and complex banks, resulting in moral hazard behaviour that leads banks to take on excessive risks in the expectation of government bailouts (Farhi and Tirole 2012).

According to a third view, the agency cost hypothesis, large and complex banks that engage in multiple activities (e.g., combining lending and trading) suffer from increased agency problems and poor corporate governance that can translate into systemic risk (Bolton et al. 2007; Laeven and Levine 2007).

According to this view, banks have a natural tendency to take on excessive risks and to grow in size, while regulators, by focusing on micro-prudential regulation, did little to prevent the resulting build-up of systemic risk. As a result, large banks tend to share many of the risk factors that other theories have identified as being important drivers of systemic risk, such as high leverage, activity diversity, and interconnectedness.

Bank size is expected to have a positive effect on the probability of survival, because it is well-known that larger banks have higher survival odds than

smaller banks. In contrast, the coefficient on bank size is expected to be negative for all size classes in the market share regressions, because the law of diminishing marginal returns suggests that it is more difficult for bigger banks (that already have larger market shares) to improve their market shares (Berger and Bouwman 2013).

4.6.2 EMPIRICAL LITERATURE

The recent financial crisis has generated tremendous interest in the study of risk-taking of financial institutions. Laeven et al. (2016) considered a sample of 412 deposit taking institutions from 56 countries with assets in excess of over \$10 billion from 2006-2008, while Bhagat et al. (2015) also analysed 702 unique financial institutions and measured risk using the Z-score. They both document a positive and significant relation between bank size and bank risk.

Beltratti and Stulz (2012) exploit variation in the cross-section of performance of 164 large banks (defined as banks with total assets greater than \$50 billion) across the world during the period of the financial turmoil (2007–2008). They document that smaller banks with concentrated ownership and more non-interest income are associated with higher idiosyncratic risk. Beltratti and Stulz (2012) further document a negative relation between bank size and Z-score. However, their relation is statistically not significant – possibly due to the limited cross-sectional variation in their bank size measure since they only consider banks greater than \$50 billion in assets. Berger and Bouwman (2013) consider a comprehensive sample of U.S. banks during 1984–2010 and document a positive relation between bank size and bank credit risk (defined as the bank's Basel I risk-weighted assets divided by total assets).

However, the recent study by De Jonghe et al. (2015) provides mixed results, depending on the size of the bank in question by stating that scope expansion and innovation is less detrimental for systemic risk and even becomes beneficial for medium sizes and large banks.

Tables 4.1(a) and (b) provide a summary of comparative studies on bank size and bank stability. Thus, the size of the bank can also have either a negative impact or a positive impact on bank stability. The above arguments above supported by the summary empirical literature in Tables 4.1 (a, b) provide the basis for the first hypothesis:

H1: The size of the bank is not related to bank stability in Ghana.

Table 4.1a Summary of Literature on Bank Size and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Beltratti and Stulz(2012)	2007-2008	164 large banks	OLS	Z-score	There is negative relationship between size and Z-score. The relationship is not statistically significant.	
Berger and Bouwman(2013)	1984-2010	The sample includes 57,243 small-bank, 1,946 medium-bank, and 1,400 large-bank observations.	OLS and GMM	Capital ratios	Positive relationship between bank size and bank credit risk(defined as the Bank's Basel I) risk weighted assets divided by total assets	
Demirgüç-Kunt and Huizinga (2013)	1991-2008	1349 individual banks in 32 countries and 689 individual banks in 2008. These countries, are mostly European, but they include Canada, Israel, Korea, Mexico, Morocco, and the US.	Instrumental Variables(IV) Estimation	Market –to –book ratio	Bank valuation is affected negatively by bank size. Specifically, we find that a bank's market-to-book value is negatively related to its absolute size,.	

Table 4.1b Summary of Literature on Bank Size and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Bhagat et al.(2015)	2002-2012	702 unique financial institutions	Fixed Effects Estimation and Two-Stage Least Square(2SLS)	Z-score	They find a positive and significant relation between size and risk-taking, it may be attributable to a lower ROA, a lower capital ratio (CAR), and/or a higher standard deviation.	
De Jonghe et al.(2015)	1997-2011	2199 banks from 76 countries	OLS	Marginal Expected Shortfall	The results indicate that scope expansion and innovation (venturing into non-traditional banking activities) is less detrimental for systemic risk the larger the bank is.	
Laeven et al.(2016)	2006-2008	412 deposit-taking institutions from 56 countries with assets in excess of US 10 billion.	OLS	CoVar	They find strong evidence that systemic risk increases with bank size.	
Source: Constructed from the Empirical Literature.						

4.7 INTERBANK BORROWING AND BANK STABILITY

Applying the theory of capital structure financing to banking shows that banks are highly levered but the type of debt or liability determines the quality of its balance sheet. Where liabilities are natural core deposits argued Shin (2010), they reduce bank risks.

However, where debts are external borrowing in the form of foreign denominated debts used to create local assets, the mismatch between currency assets and liabilities will increase the exposure of the bank as the local currency generally remains unstable and requires more of the local currency to settle the debt when they are due(Inoguchi 2013). There is also interbank risk which is the risk of direct or indirect loss resulting from lending in the interbank money market (Filipović and Trolle 2013), which creates a further network effect that leads to potential systemic risks (BOE 2009).

4.7.1 THEORETICAL LITERATURE

Battiston et al. (2012) using a model which deals with credit inter-linkages find that financial acceleration, i.e. the positive feedback of financial robustness on itself, is a sufficient condition for systemic risk from interbank borrowing defaults. It eventually more than offsets the stabilising role of risk sharing and amplifies the effects of a shock to a single agent of the network, leading to a full- fledged systemic crisis. The relationship between the probability of default, both individual as well as systemic, and connectivity is U-shaped. If connectivity is already high, a further increase may have the perverse effect of amplifying financial distress through the financial acceleration to increase systemic risk.

The trade-off between risk-sharing possibilities and contagion risk can be affected by the degree of diversification or interconnectedness. Nier et al. (2007) model the banking system as a network with different degrees of connectedness. They show that for a given level of connectivity, an increase in interbank asset exposures facilitates the propagation of shocks and causes a higher number of defaults.

Georg (2013) examined contagion risk in different types of networks. He finds that interbank loan volumes above an upper threshold decrease systemic stability. The threshold level depends on the level of inter-connectedness. Larger exposures are less likely to conflict with financial stability for higher levels of interconnectedness. Hence, larger international exposures can be assumed to make banking systems prone to crisis. For example, banking systems might not be able to withstand large and unexpected withdrawals or sudden losses in cross-border claims. How far this holds true might depend on the level of network diversification.

4.7.2 EMPIRICAL LITERATURE

Batiz-Zuk et al. (2015) examined 40 Mexican banks between 2008- 2012 of the impact of interbank lending failures. They found that a significant 18 per cent of the total assets to be compromised. Allen et al. (2014) simulated the impact of market discipline through interbank deposit and interest on loans on the behaviour of 51 multinational banks from 20 developed countries and their subsidiaries from 2005 -2012. They conclude that subsidiaries that depend on interbank borrowing experience decline in credit growth during the crisis.

Along the same lines, Inoguchi (2013) studied the effect of borrowing of foreign currency and interbank borrowing in Korea, Thailand and Malaysia from 1993-2006. They find a positive and a significant relationship between stability and interbank borrowing through market discipline effects.

Anginer and Dermirgüç-kunt (2014) took a different perspective about the interbank lending and borrowing and financial stability by measuring the co-dependence default risk of 1,942 publicly traded banks in 65 countries globally. They find that high openness of the financial sector through financial liberalisation leads to higher banking sector co-dependence. Again higher co-dependence is positively associated with the financial crisis, particularly the 3-year period leading to the financial crisis.

Tonzer (2015) recently, examined the effects of international linkages in interbank markets on the stability of interconnected banking systems of the main 17 advanced countries for the period 1994-2012. He finds that countries that are linked through foreign borrowing or lending positions to more stable banking systems abroad are significantly affected by positive spill over effects. He finds that the effect of integration in international interbank markets on stability is ambiguous. While larger cross-border exposures are likely to increase bank risks, higher diversification has a counterbalancing effect. In other words, bilateral linkages can have a beneficial effect on stability.

The theoretical and empirical literature are shown in Table 4.2 and lead to the second hypothesis that:

H2: The level of external and interbank borrowing of the bank is not related to bank stability in Ghana.

Table 4.2 Summary of Literature on Interbank Borrowing and Bank Stability					
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results
Inoguchi(2013)	1993-2006	Ranging from 161 banks in 1997 to 58 banks in Korea, Malaysia and Thailand	Panel Regression	Equity divided by total assets ; liquidity assets divided by total assets ; and loan loss reserve s divided total loans	Improving both the interbank and the stock market may have played a role in establishing a sound banking system through market discipline effects. Interbank loans and foreign currency lending to commercial banks with higher risks declined and borrowing rates charged to those banks rose.
Allen et al.(2014)	2005-2012	51 multinational banks from 20 developed countries and their foreign subsidiaries (269).	System GMM	Market Discipline or Change in deposit and interest rates of subsidiaries	The deterioration of the parent banks' financial strength resulted in lower levels of support for their subsidiaries via the interbank market, which affected their subsidiaries' credit growth negatively, especially the credit growth of those subsidiaries who were strongly dependent on interbank borrowing.
Anginer and Demirguc-Kunt (2014)	1998-2010	1942 publicly traded banks 65 countries globally	Cross-sectional regression	Changes in log default probability	Liberalised financial sector leads to higher banking sector co-dependence. Higher co-dependence is positively associated with the financial crisis, particularly the 3-year period leading to the financial crisis.
Batiz-Zuk et al.(2015)	2008-2012	40 Mexican Banks	OLS and Logit Regression Analysis	Lending Preference Index(LPI)	The share of total assets compromised by contagion due to idiosyncratic failure for the benchmark case is 18 per cent. This result is both significant and similar to results reported in the literature.
Tonzer(2015)	1994-2012	17 developed countries	OLS and GMM	Z -score	He finds that the effect of integration in international interbank markets on stability is ambiguous.
Source: Constructed from the Empirical Literature.					

4.8.0 NON –PERFORMING LOANS AND BANK STABILITY

Non-performing loans are loans for which there is virtually no hope that the interest and principal would be repaid, or for which the repayment of interest and principal are doubtful. Generally, non-performing loans are technically defined by regulation and by international reporting standards (BCBS 2016: 8). The BIS uses a standard five-tier loan classification system, where loans are classified as: Passed, Special Mention, Substandard, Doubtful, and Virtual Loss and Loss (unrecoverable). By regulation, non-performing loans are loans classified as being substandard to loss based on the default period.

4.8.1 THEORETICAL LITERATURE

Non –performing loans reduce the quality of bank assets, profitability and the stability of banks by depleting the equity of banks. High level of non-performing loans reduces the bank's net worth and could lead to the bank's insolvency (Nkusu 2011).

The relationship between NPL and bank stability can also be explained from bad management, skimping and moral hazard hypotheses. Moral hazard may lead managers to increase the riskiness of their loan portfolio when their banks are thinly capitalised, while bad management manifests in the form of poor skills in credit scoring, appraisal of pledged collaterals and monitoring of borrowers (Berger and De Young 1997; Ghosh 2015).

4.8.2 EMPIRICAL LITERATURE

Foos et al. (2010) examined the inter-temporal relation between abnormal loan and future loan losses in 16,000 individual banks from 16 major countries

including the US, Canada, Japan and 13 European countries during the period 1997-2007. The study revealed that abnormal loan growth is significantly and negatively related to bank solvency. In 14 out of 16 countries, higher abnormal loan growth led to lower capital ratios, indicating a decreased bank solvency levels. This is because past loan growth leads to an increase in contemporaneous loan losses and to a decrease in relative interest income.

Michalak and Uhde (2012) examined the effect of credit risk securitisation or cash and synthetic securitisation transactions on the stability score of 60 stock-listed bank holdings in the EU-13 plus Switzerland over the period from 1997-2007. They find a negative impact of securitisation on bank stability because of the existence of direct and indirect effect of the credit risk exposures within the first-loss position.

A number of studies examined the feedback effects from the banking system to the real economy from a cross-country perspective. Nkusu(2011) unlike De Bock and Demyanets(2012) who focused on emerging economies, studied 26 advanced economies in the period of 1998–2009, found that a sharp increase in NPLs led to a decline in house prices, credit-to-GDP ratio, and GDP growth. The confluence of adverse responses in key indicators of macroeconomic performance—GDP growth and unemployment—leads to a downward spiral in which banking system distress and the deterioration in economic activity reinforce each other.

These theoretical and empirical findings are shown in Table 4.3 below and the current level of non-performing loans reported by Ghanaian banks provide the basis for the third hypothesis:

H3: The level of non-performing loans is higher for the bank with a lower level of bank stability in Ghana.

Table 4.3 Summary of literature on Non-Performing Loans and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Foos et al.(2010)	1997-2007	16,000 banks	Multivariate Analysis	Equity to Total Assets	Abnormal loan growth is significantly related to bank solvency.	
Nkusu (2011)	1998-2009	26 advanced economies	Panel VAR	NPL	A sharp increase in NPL triggers long-lived tailwinds that cripple macroeconomic performance from several fronts and reduce bank stability.	
De Bock and Demyanets (2012)	1996-2010	25 Emerging Markets	Vector Auto Regressions (VAR)	NPL	That worsening asset quality weighs on GDP growth and leads to a depreciation of the exchange rate.	
Michalak and Uhde(2012)	1997-2007	60 stock-listed bank holdings in the EU-13 plus Switzerland	Two-stage least squares(2SLS) with fixed effects , time effects and a robust clustering	Z-score ; Expected default frequency (EDF)	They find a negative impact of securitization on bank profitability and capital environment and a positive relationship between securitization and the issuing bank's return volatility. This finding supports 'securitisation-fragility' view.	
Source: Constructed from the Empirical Literature.						

4.9.0 RISK GOVERNANCE AND BANK STABILITY

Rahim et al. (2015) define risk governance as the ways directors are responsible to optimise and monitor risk in an organisation. They argued that the main role of risk governance is to improve the potential for survival and growth of banks, prevent sudden shocks, and monitor internal and external activities across the world for high-profile collapses of major institutions.

According to Mongiardino and Plath (2010), risk governance requires: (1) a dedicated board level risk committee, of which (2) a majority should be independent, and (3) that the CRO should be part of the bank's executive board. Based on a survey among 20 large banks, they find that only a small number of banks followed these guidelines in 2007.

4.9.1 THEORETICAL LITERATURE

Under risk management irrelevance proposition, Stulz (2003) argues that for risk management to increase the value of a firm, it must be more expensive to take a risk within the firm than to pay the capital markets to take it. Stulz (2003) argued that with market imperfection, bank risk management will eliminate or reduce deadweight costs, bankruptcy costs, reduce taxes, promote optimal capital structure which balances the tax benefits of debt against the costs of financial distress and debt overhang.

The current theoretical literature argues that from control perspectives (BCBS 2012) risk governance is an integral part of corporate governance that focuses on enterprise risk management. The board's risk committee is at the apex and

through the risk and compliance departments provide the second lines of bank-wide enterprise risk management defence (BCBS 2012; Dermine 2013).

4.9.2 EMPIRICAL LITERATURE

The contemporaneous study by Ellul and Yerramilli (2013) investigate whether a strong and independent risk management is significantly related to bank risk taking and performance during the credit crisis in a sample of 74 large US bank holding companies for the period 1995-2010. They construct a Risk Management Index (RMI) which is based on five variables related to the strength of a bank's risk management, including a dummy variable whether the bank's CRO is a member of the executive board and other proxy measures for the CRO's power within the bank's management board. Their findings indicate that banks with a high RMI value in 2006 had lower exposure to private-label mortgage-backed securities, were less active in trading off-balance sheet derivatives, had a smaller fraction of non-performing loans, had lower downside risk, and a higher Sharpe Ratio during the crisis years 2007/2008.

Aebi et al. (2012) analyse the influence of bank-specific corporate governance, and in particular "risk governance" characteristics on the performance of banks during the financial crisis. Most importantly, their results show that banks, in which the CRO reports directly to the board of directors, perform significantly better in the financial crisis while banks in which the CRO reports to the CEO perform significantly worse than other banks in their sample.

Again Battaglia and Gallo (2015) recently studied 15 Chinese and 21 Indian banks to ascertain the relationship between risk governance and performance

variables such as ROA and ROE which can proxy as stability variables. Using a pooled regression model, they find a positive relationship between the size of the risk committee and ROE and ROA suggests that over the period 2007–2011 banks with larger risk committee perform better in terms of profitability.

Regulatory enforcement of risk based management through micro-prudential regulation, Basel III requirements under the pillar II or supervisory review process point to the changing composition of boards of banks globally.

Given the gap in the literature in Chapter 2, the theoretical and empirical evidence summarised in Table 4.4, justify the inclusion of risk governance as one of the independent variables and lead to the fourth hypothesis which stresses that risk governance as part of enterprise risk management impacts positively on bank stability as follows:

H4: The level of regulatory risk governance practices of the bank is positively related to bank stability in Ghana.

Table 4.4 a Summary of literature Risk Governance and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Aebi et al.(2012)	2007-2008	372 Banks	Time-series regression	The excess return to the respective bank's stock	They find that banks, in which the CRO reports directly to the board of directors, perform significantly better in the financial crisis while banks in which the CRO reports to the CEO perform significantly worse than other banks in our sample.	
Elul and Yerramilli (2013)	1995-2010	72 BHC in USA	OLS and Instrumental-Variables Regressions	Tail Risks	The results suggest that a strong and independent risk management function can curtail tail risk exposures at banks, and possibly enhance value, particularly during crisis years.	
Battaglia and Gallo(2015)	2007-2011	15 Chinese and 21 Indian banks	Population Average (PA) Model or Pooled OLS Model	Tobins Q;ROA; ROE; P/E	They find a positive relationship between the size of the risk committee and ROE and ROA	
Source: Constructed from the Empirical Literature						

4.10.0 REGULATORY INDEPENDENCE AND BANK STABILITY

Regulatory independence is part of the current Basel core practices for effective banking supervision issued in 2012. Regulatory independence involves the degree of the state and regulator's participation in the shareholding of banks, and the appointment of board members (Doumpos et al. 2015). According to Casu et al.(2015), policy makers in most emerging economies seem to consider state ownership of banks as a second best solution, in 'normal' times at least. This is because during a crisis they may well have to nationalise banks to save them. Governments are increasingly subjecting the public banking sector to market discipline, by treating them in a manner similar to private banks in terms of supervision and other factors.

4.10.1 THEORETICAL LITERATURE

The theoretical literature is much less abundant with some notable exceptions. Andrianova et al. (2008) develop a locational model of banking that distinguishes between state-owned and private banks. They show that state – owned banks can play an important role in the banking system but this depends on the institutional quality of a given country. More specifically, in the presence of opportunistic private banks and poor institutional quality, the nonexistence of state banks may lead to financial disintermediation.

Andries and Billon (2010) build a theoretical model in which banks face a risk of failure in bad states of the economy, i.e. when productive firms suffer a low productivity state. They put forth that public banks have a more stable deposit base, because depositors perceive that their funds are better protected in times of crisis in the case of public banks. This mechanism helps government-owned

banks to insulate their slowdown of lending from downturns when the economy is hit by a financial shock.

Brei and Schclarek (2015) argue from a theoretical perspective that the lending behaviour of private and public banks in response to adverse economic shocks and develop a theoretical framework that models the interactions of depositors, firms, and private and public banks. The results indicate that lending during normal times is similar across private and public banks. During a financial crisis, however, lending activities by private banks decrease to a larger extent than that of public banks. These results indicate that public banks play a counter-cyclical role in their banking systems, while private banks play a more pro-cyclical role.

4.10.2 EMPIRICAL LITERATURE

Regarding the behaviour of government banks the evidence from non- crisis periods is quite negative (Cull and Martinez Peria 2013). Along similar lines, Iannotta et al. (2013) who studied 210 banks from 16 European countries with minimum assets of €10 Billion from 2000-2009 find that government-owned banks (GOBs) have lower default risk but higher operating risk than private banks, indicating the presence of governmental protection that induces higher risk taking. Again GOBs' operating risk and governmental protection tend to increase in election years. These results are consistent with the idea that GOBs pursue political goals.

In contrast, the literature examining the lending of state banks during business cycles is quite sparse with mixed results (Cull and Martinez Peria 2013; Brei

and Schclarek 2013). Cull and Martinez Peria (2013) examine the impact of bank ownership on credit growth in a sample of Latin American and Eastern European developing countries before and after the global financial crisis, finding mixed results. They show that state banks in Latin America acted in a countercyclical fashion during the crisis, whereas those in Eastern Europe did not, hence emphasizing regional differences. Again Bertay et al. (2015) who examined 1633 banks from 111 countries from 1999-2010 concluded that state banks appear to lend countercyclically in GDP terms independently of the occurrences of the financial crisis.

Using an international sample of banks from 50 countries over the 1994–2009 period, Brei and Schclarek (2013) provide robust evidence that government-owned banks do play countercyclical role by increasing lending in response to financial crises relative to normal times, while private banks decrease lending relative to their normal lending pattern. They show that the average private bank lends at a higher growth rate than the average government-owned bank in normal times (11% per annum compared to 8%). However, once the crisis hits, government-owned banks lend at a higher rate (9% per annum vis-à-vis 7% for private banks).

From the review of literature summarised in Table 4.5; we therefore, test if bank stability is related to state and or the central bank ownership of the bank. It is therefore hypothesised that:

H5: The state or the central bank ownership of the bank is not related to bank stability in Ghana.

Table 4.5 Summary of literature on Regulatory Independence and Bank Stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Brei and Schclarek (2013)	1994-2009	764 major banks from 50 countries	System GMM	Annual Loan Growth	Robust evidence that government - owned banks counteract the lending slowdown of private banks during crisis relative to normal times	
Cull and Martinez Peria (2013)	2004-2009	201 banks from Latin America and 192 banks from Eastern Europe totalling 402 banks	Fixed -Effects Models with robust standard errors	The growth of Total Gross Loans	Government- owned banks in Eastern Europe did not act counter-cyclically. The opposite is true in Latin America,	
Iannotta et al. (2013)	2000-2009	210 banks from 16 European countries	OLS Regression with robust standard error	Credit or Issuer ratings	On average, government-owned Banks have a lower default risk – as reflected in better issuer ratings – than their private counterparts. However, this lower default risk does not derive from a	
Bertay et al.(2015)	1999-2010	1633 Banks from 111 countries	GMM	Credit growth	State banks thus appear to lend countercyclically in GDP terms independently of the occurrence of a financial crisis	
Source: Constructed from the Empirical Literature.						

4.11.0 FOREIGN OWNERSHIP AND STABILITY

The influx of banks into a country's economy may impact positively or negatively on its stability depending on many factors such as the maturity of the financial sector, level of banking services technology, the capital base of the local banks, skills and complexity of transactions undertaken. Likewise the licensing regime also determines the degree to which foreign players can have control over domestic banking assets (Mulyaningsih et al. 2015).

4.11.1 THEORETICAL LITERATURE

The relationship between foreign ownership and stability follows from the distinction between global advantage and home field advantage hypotheses (Berger et al. 2000). In spite of the strategic role played by such domestic banks in the local economy, Hawkins and Mihaljek (2001) argue that for a small economy, it may make sense not to have any domestically owned banks at all, as they may not be able to diversify their risks sufficiently.

Čihák and Schaeck (2014) focus on bank efficiency as a possible conduit through which competition influences bank soundness. The global advantage hypothesis states that foreign banks might benefit from competitive advantages relative to their domestically-owned peers. Foreign-owned banks use more advanced technologies due to stiff home market competition. Foreign banks might also be more competitive when compared to domestic banks due to an active market for corporate control in the home country, and because they have access to an educated labour force that is able to adopt new technologies. The home field advantage hypothesis predicts that foreign banks are at a

disadvantage when compared to domestic banks. Foreign-controlled banks are assumed to perform less well than domestically-controlled banks due to higher costs of providing the same financial services or due to lower revenues.

However, Detragiache et al. (2008) demonstrate a theoretical model, showing that foreign banks are better than domestic banks at monitoring “hard” information, such as accounting information or collateral values, but not at monitoring “soft” information, such as the borrower’s entrepreneurial ability or trustworthiness. Foreign bank entry may hurt bank customers and worsen their welfare suggesting that learning is especially important for foreign banks (Claessens and Van Horen 2012).

Huizinga and Laeven (2007) also suggest that foreign banks might only provide limited products or primarily serve firms from their home country, which might lead to more volatile earnings. In addition, international tax differences might encourage profit shifting from local subsidiaries or branches. Findings from theoretical and empirical studies on the effect of foreign ownership on domestic bank performances are mixed, given their complexity.

4.11.2 EMPIRICAL LITERATURE

Many studies using cross-country data empirically compare the performance of foreign banks with domestic banks and find that foreign banks operating in developing countries are more efficient and competitive than domestic banks (Yeyati and Micco 2007; Angkinand and Wihlborg 2010; Claessens and Van Horen 2012; Lee and Hsieh 2014).

Angkinand and Wihlborg (2010) indicate that foreign ownership is associated with greater risk-taking, i.e. less stability as measured by the Z-index (a proxy for distance to default) in favour of the home field advantage hypothesis.

Lee and Hsieh(2014) applied the GMM techniques on dynamic panels using bank-level data for Asian countries to investigate the impact of foreign ownership on financial stability, as well as whether the relation between foreign ownership and stability changes under different conditions of bank reforms in the host country. First, the existence of the home field advantage hypothesis is supported; nevertheless, when considering the effects of bank reforms, the global advantage hypothesis holds. Second, an inverse U-shaped relation between foreign ownership and stability is supported. Similarly, in a sample of Latin American banks, Yeyati and Micco (2007) findings were mixed.

Moyo et al.(2014) in a sample of 662 sub-Saharan African banks which included Ghanaian banks, found that the entry of foreign banks have significantly and positively impacted on bank stability.

And, the existence of both foreign and local banks raises the question as to whether local and foreign banks have similar levels of stability. As shown by Claessens and Van Horen (2012), the profitability of foreign banks is importantly affected by home, host and institutional factors. They find, for example, that foreign banks perform better when from a high income country and when regulations in the host country are relatively weak. Also, foreign banks from home countries with the same language and similar regulation as the host country tend to perform better.

Most of the new banks are from Nigeria, South Africa and the UK where Ghana shares a similar colonial, language, financial system integration policies and use the common law as the basis of their legal framework. As a consequence, to date, the question for whether banks with greater foreign ownership improve the performance (or risk) of financial intermediaries is still unresolved. Thus, the impact of foreign participation on bank stability can either be positive or negative.

The inferences made from the summarised literature in Tables 4.6 (a, b) and the stability arguments are therefore tested in relation to the changing ownership of banking assets by origin in Ghana with the following hypothesis:

H6: The level of foreign participation or ownership of the bank is not related to bank stability in Ghana.

Table 4.6a Summary of literature on Foreign participation and Bank Stability					
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results
Yeyati and Micco (2007)	1993-2002	Eight Latin American countries (Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Mexico and Peru)	Weighted least squared (WLS) estimates	Z-score	. Foreign penetration has indeed induced lower levels of risk.
Angkinand and Wihlborg(2010)	1997-2003	52 countries: 14 industrial, 32 emerging market, and 6 developing countries.	Ordinary Least Squares (OLS), while the random effects model is used in the cross-section time-series regression.	Z-score	Foreign ownership reduces the Z-scores (increased risk-taking) in countries with low explicit coverage. In emerging markets it seems that increased foreign ownership reduces risk-taking at high levels of explicit coverage.

Table 4.6b Summary of Literature on Foreign participation and bank stability						
Author (Year)	Study Period	Sample size	Methodology	Bank risk-taking variable	Summary results	
Claessens and Van Horen (2012)	1999 and 2006	51 countries from OECD and developing countries	Weighted OLS	Profit before taxes divided by assets.	Foreign banks should not be looked upon as a homogeneous group. Rather banks from certain countries and with certain characteristics will tend to be better equipped to operate in certain foreign countries. This explains why the results from the various literature are not univocal.	
Lee and Hsieh(2014)	1995-2009	1387 individual banks in 27 selected Asian countries.	dynamic panel GMM techniques	Z-score	They find an inverse U-shaped relation between foreign ownership and stability.	
Moyo (2014)	1995-2010	662 banks from 16 SSA countries	Probit logit model	CAMELS –rating system and Z-score	Entry of foreign banks significantly and positively impact on stability.	
Source: Constructed from the Empirical Literature						

4.11.0 CHAPTER SUMMARY

The chapter discussed the research philosophy and the development of the hypotheses for the study. The research paradigm provides the direction to be taken in the research methodology. Table 4.7 presents the summary of the hypotheses developed. In the next chapter, the methodology to test the hypotheses developed for the study will be presented.

Table 4.7: Summary of Hypotheses

Variables	Hypothesis	Expected sign of the relationship
H1: Bank size	The size of the bank is not related to bank stability in Ghana.	Positive (+) or Negative (-)
H2: Interbank Borrowing	The level of external and interbank borrowing of the bank is not related to bank stability in Ghana.	Positive (+) or Negative (-)
H3: Non-Performing Loans	The level of non-performing loans is higher for the bank with a lower level of bank stability in Ghana.	Negative (-)
H4: Risk Governance	The level of regulatory risk governance practices of the bank is positively related to bank stability in Ghana.	Positive (+)
H5: Regulatory Independence	The state or the central bank ownership of the bank is not related to bank stability in Ghana.	Positive (+) or Negative(-)
H6: Foreign participation or Ownership	The level of foreign participation or ownership of the bank is not related to banking stability in Ghana.	Positive (+) or Negative(-)

Source: Constructed from the Hypotheses Formulated

CHAPTER 5

METHODOLOGY

5.1 INTRODUCTION

This chapter describes the research methodology of this study. It describes the problem space and ways that other researchers have studied the problems of banking stability, regulatory and bank-level risk taking activities. The design of the methodology is based on prior research into the relationships as discussed in Chapter 4. The method is intended to provide a robust repeatable method by which the research questions can be answered. This chapter, therefore, describes the method of data collection, the variables used to test the hypotheses and the statistical techniques employed.

5.2.0 SAMPLE AND PERIOD SELECTION

The period of study is five years from 2009 to 2013 and covers the period that banks in Ghana were required to recapitalise by the regulator and the period after that. The focus of the study is on the activities of licensed banks, so the sample does not include microfinance companies, investment companies, and other non-bank financial institutions. There are currently 27 licensed banks in Ghana accounting for almost 75% of the financial assets of the country. Two of these 27 banks, namely Energy Bank and Royal Bank, were dropped from the study because they did not have the necessary five years financial data required for the computation of the Z-scores. Five other banks are also excluded for insufficient data or lack of information.

The final sample consists of 20 banks, accounting for 74% of the existing bank population. In terms of assets, the 20 banks hold about 96% of the banking assets (commercial banks) in Ghana. Appendix 5.1 provides the summary of the sampling procedure and sample size. According to Pallant (2007), different authors tend to give different guidelines concerning the number of observations required for multiple regression tests. Stevens (1996) cited in Pallant (2007) recommends that for social science research, about 15 data points per predictor are needed for regression models. Tabacknick and Fidell (2007) suggest a rule of thumb for determining the minimum sample size, N , for a regression analysis as, 50 plus 8 times the number of independent variables in the regression model (M). Thus:

$$N = 50 + 8M$$

The minimum sample size ensures that the number of observations in the statistical analysis is large enough to achieve sufficient statistical power and reduce estimation error. Going by Tabacknick and Fidell (2007), this implies our model, with six independent variables, will need 98 cases. The sample of 20 banks over the five-year period results in a balanced panel of 100 bank-year observations.

5.3 DATA COLLECTION METHODS

The following section discusses the method of data collection and type of data that were collected to conduct the study. The data for the study are compiled from different sources. Bank-specific data, including their annual reports, are obtained from the Investor Relations Departments of the various banks. The

reports are further verified for consistency from the Securities and Exchange Commission (SEC) of Ghana, where the bank in question is listed on the exchange. PricewaterhouseCoopers (2013, 2014) Banking Survey reports in 2013 and 2014 capture data on the average return on equity and average return on assets of banks in the country from 2009 to 2013 and are used to verify the reliability of the data obtained from other sources. Further reliability checks are done by recalculating the ratios from the original annual reports. In analysing the data, the details are further cross-checked or validated from the Bank of Ghana's recent Financial Stability Reports.

5.3.1 ASSUMPTIONS

With over 70% of Ghanaian banks not on the stock market to determine their market values, and the requirement to comply with current International Financial Reporting Standard (IFRS) 13 on Fair Value, banks generally determine the fair value of their assets and liabilities as at the date stated on their financial statements.

Also, the on-site inspections and verifications by the supervisory authorities would ensure that the bank's financial position is accurately reported.

Furthermore, the financial reports of the sample banks are based on the same International Financial Reporting Standards and monitored by the same regulatory authority. The accounting data and the data items from the regulatory reports will be based on a common approach and, therefore, comparable across the banks. Thus, in the absence of the market values, the balance sheet figures will be as close as we can get.

5.3.2 DATA COLLECTED

The following data and information have been collected. The five years annual reports of all the twenty banks published or submitted to the Securities and Exchange Commission. Other data items were collected from the total banking activity figures submitted by the banks to the Bank of Ghana, the International Monetary Fund Country reports, the Bank of Ghana Financial Stability Reports and the Statistical Service of Ghana. For each bank and for each year over the period 2009 to 2013, the following accounting data and regulatory data items were collected:

- (i) Total banking assets, liabilities and income sources;
- (ii) Interbank liabilities and borrowings;
- (iii) The Return on Average Assets (ROAA);
- (iv) The Return on Average Equity (ROAE);
- (v) Individual bank's assets within the total system-wide banking assets;
- (vi) Actual Non-Performing Assets of each bank;
- (vii) Structure and existence of Risk Governance in each bank; and
- (viii) Bank of Ghana and direct Government of Ghana shareholdings, shareholdings of quasi-state institutions, notably Social Security and National Insurance Trust (SSNIT), Social Insurance Company (SIC) and Ghana Cocoa Marketing Board (Cocobod) in each bank.

As all the data outlined above are publicly available, either from the banks themselves or other official sources, it is believed that the use and analysis of the data do not raise any ethical concerns, such as the confidentiality and anonymity of subjects, potential harm to participants, conflict of interest on the part of the researcher, and other general issues of access to data.

5.4.0 DATA PREPARATION AND MEASUREMENT OF VARIABLES

The first preparatory analysis technique is preparation of logarithms (logs) for some of the data. Mathematical logs are used in econometrics analysis for several reasons. First, because of their size reduction properties, they reduce the scale of raw data, which will make it easier to compare small institutions to larger institutions. This is particularly important because the sizes of the banks in this study vary widely; if you consider that some of the banks included are large-scale multinational institutions and others are domestic or regional banks in developing countries, the scale problem becomes clear. In effect, logs perform the same function that the ratios calculated for some of the variables discussed below do, by making it possible to compare institutions of different sizes.

The natural log function (\ln) can be applied to dependent or independent variables (Gujirati and Porter 2009). The dependent variable, the Z-score and the independent variable bank size are prepared to have logs.

The second is the use of dummy variables. In regression analysis, the dependent variable is also influenced not only by ratio scale variables like non-performing loans and interbank borrowing but also variables that are essentially

qualitative or nominal scale in nature such as origin of banks which can be foreign or local. Such variables usually indicate the presence or absence of a 'quality' or an attribute (Gujirati and Porter 2009). One way to quantify such attribute is by constructing artificial variables that take on values of 1 or 0, 1 indicating the presence of that attribute and 0 indicating the absence of that attribute. In this research origin and regulatory independence are treated as dummy variables (Gujirati and Porter 2009).

The third is the use of ordinal scales. It is used to measure a higher level of utility (Gujirati and Porter 2009). Therefore in this research, a scale of 1- 4 is used to measure the level of risk governance maturity. Using a scale of 1- 4; 4 will represent the highest and 1 the least.

5.5.0 MEASURES OF BANKING STABILITY

This section discusses the two measures of banking stability, the CAMELS and the Z-score used in this study as discussed in chapter 1. It discusses how the composite CAMELS and the Z-score index are measured and their interpretation in this study.

5.5.1 CAMELS RATING SYSTEM

The CAMELS rating is a composite measure used to evaluate the financial stability of financial institutions on six dimensions – Capital adequacy, Asset quality, Management, Earnings quality, Liquidity, and Sensitivity to market risks. The six components of the CAMELS and the composite measure are calculated in this study as described below.

5.5.1.1 Capital Adequacy Ratio (CAR)

The CAR is defined as $CAR = (\text{Tier I Capital} + \text{Tier II Capital}) / \text{Total Risk-Weighted Assets}$. Where Tier 1 or core capital include the stated capital, share premium, income surplus, and non-controlling interest after deductions for goodwill and specified assets such as intangibles and certain classes of investments. Tier 2 capital (supplementary capital) consists of revaluation reserves, qualifying subordinated loan capital debt not exceeding 50% of Tier 1 capital, collective impairment allowances and unrealised gains arising in the fair valuation of equity instruments held as available for sale. Qualifying Tier 2 capital is limited to 100% of Tier 1 capital.

The risk-weighted assets are measured by following the Bank of Ghana business rules for deposit-taking institutions in Ghana (BOG 2000). The rules ensure that the computation of the risk-weighted assets takes into consideration, a hierarchy of five risk categories. The definitions of the five risk categories and their respective risk-weights are given in Appendix 5.2. The total of the risk-weighted assets (TRA) is then calculated by multiplying the value of assets in each risk category by its risk-weight and then adding the five risk-weighted assets together.

5.5.1.2 Asset Quality Ratio

The asset quality assessment is based on evaluating credit risks associated with the bank's portfolio of loans and investments. The asset quality ratio is measured as gross non-performing loans, as per the Bank of Ghana Prudential Norms (specifically impaired loans), divided by the total credit portfolio or loans.

The total credit portfolio comprises of overdraft and term loans to individuals, other private enterprise, joint private and state enterprises and staff. The lower the ratio, the higher the asset quality and the reliability of the bank's credit portfolios (BOG 2000).

5.5.1.3 Management Quality Ratio

Management forms the mechanism that makes decisions to ensure the bank minimises risks and exercises control in its operations. The quality of management takes into account leadership, governance and compliance issues. These characteristics can be measured qualitatively and therefore its composite measurement which has some quantitative attributes should be used with some caution.

Because these are subjective attributes, the efficiency of the bank has been used as a proxy for management quality in the literature (Bassett et al. 2015). Management quality is therefore measured in this study as the ratio of non-interest operating expenses to operating income (Bassett et al. 2015; Casu et al. 2015). Non-interest operating expenses include employee-related expenses, occupancy charges or rent, depreciation and amortisation, directors' emoluments, fees for professional advice and services, publicity and marketing expenses. Operating income is the sum of net interest income, fee and commission income, trading income and other operating income such as profit on disposal of property and equipment. A lower ratio, indicates higher operational efficiency and vice versa.

5.5.1.4 Earnings Ratios

The earnings ratios reflect the bank's ability to absorb losses, expand its financing, as well as, its ability to pay dividends to its shareholders, and help to develop an adequate amount of internal capital through profit retentions (Christopoulos et al. 2011). They also reflect the financial risks assumed by the equity shareholders because of the prior claims of depositors and bondholders. The bank's earning ability has been measured using the following three profitability ratios.

5.5.4.1.1 ROA = [Net Profits/ Total Assets] x 100

Pagratis et al. (2014: 11) and Casu et al.(2015: 717) defined return on assets (ROA) as the ratio of net profit after tax to total assets in book values. Net profits are measured as profit before tax less income tax and the Ghana government's fiscal stabilisation levy. The higher the ratio, the more profitable the bank is.

5.5.4.1.2 ROE = [Net Profits/ Own Capital] x 100

Pagratis et al. (2014:11) and Casu et al. (2015: 717) define return on equity (ROE) as the ratio of the net profit after tax to bank equity in book values. Net profit is measured as profit before tax less income tax and the fiscal stabilisation levy in Ghana. Own capital comprise of stated capital, income surplus, revaluation reserve, statutory reserve fund and regulatory credit risk reserve. The ratio shows a bank's ability to generate income from its capital.

5.5.4.1.3 Net Interest Margin (NIM)

Following Claessens et al. (2016), the net interest margin is measured as net interest income divided by the average operating assets times 100 per cent. The net interest income is calculated as interest receipts from placement and short-term funds, treasury bills and government securities and loans and advances less interest paid to demand depositors, time depositors, and providers of borrowed funds and savings. The operating assets are the interest- or fee-earning assets of the bank and the total figure is calculated as the sum of cash and liquid assets, loans and advances, and any asset that directly generates interest or fees. The higher the ratio, the better the bank would be at accommodating any potential losses from loan defaults and other settlement risks.

5.5.1.5 Liquidity Ratios

Liquidity ratios are used to assess the ability of the bank to meet obligations as they come due, without incurring unacceptable losses. They also assess a bank's ability to meet cash flow obligations, which are uncertain as they are affected by external events and other agents' behaviour (BOG 2014). In this study, the liquidity of a bank is measured using the following ratios.

5.5.1.5.1 Loans to Total Deposits (L1) = Total Loans / Total Deposits

The total loan to total deposits ratio shows the total loans granted as a proportion of the bank's customer deposits (IMF 2013b). The total deposits include current accounts balances, cash collateral, savings account, and time

deposit balances. The lower the ratio, the higher the bank's level of liquidity and safer.

5.5.1.5.2 Circulating Assets to Total Assets (L2) = Circulating Assets/ Total Assets.

The other liquidity measure used in this study is the ratio of circulating assets to total assets. Circulating assets include cash in hand, claims against other banking institutions and its trading, investment and derivatives portfolios(Christopoulos 2011). A higher ratio means the bank has a better liquidity status and, therefore, likely to be stable.

5.5.1.6 Sensitivity to Market Risks

A bank's sensitivity to market risks describes the extent to which potential changes in interest rates, foreign exchange rates, equity and commodity prices affect the bank's profits and the value of its assets (Saunders and Cornett 2008:171). However, the most important risks for most banks in Ghana are interest rate risks and risks from their foreign exchange operations. In this study, a bank's sensitivity to market risks is measured as the ratio of total securities to total assets (Christopoulos 2011). Total securities include trading assets, investment securities available for sale and government securities. The lower the ratio, the better for the bank since a higher value of this ratio would indicate a greater exposure to market risks.

5.5.1.7.0 Individual rating of CAMELS variables

Regulatory authorities generally set limits to determine the performance of banks and also how banks comply with their stability guidelines. In some cases, minimum levels are set for evaluation of banks. For example, the minimum CAR set by Basel II is 8% but regulators can adjust upwards the minimum threshold to reflect their financial and economic environment. In Ghana, the minimum CAR is set at 10 % and NPL is also set at 1%. With the various ratios calculated, each bank is rated on a scale of 1 (strong) to 5 (weak), in each of the six components as shown in Table 5.1. The rating criteria are based on the institutional practices of the regulatory authorities in Ghana.

There is broad agreement in the empirical literature that the CAMEL indicators are useful in assessing the financial vulnerability of banks. Supervisors often use (combinations of) these indicators to come up with an assessment of a bank's soundness. However, there is no clear agreement in the literature on how exactly to combine the various components into a composite CAMELS indicator (Klomp and De Haan 2012). Using the Federal Financial Institutions Examination Council (FFIEC) scale, composite and component ratings are assigned based on a 1 to 5 numerical scale. A "1" indicates the highest rating, strong in performance and risk management practices, and least degree of supervisory concern. A "5" indicates the lowest rating, weakest performance, inadequate risk management practices, and thus, the highest degree of supervisory concern. The composite rating bears a close relationship to the component ratings assigned.

Table 5.1: CAMELS Rating of Individual Variables

	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5
Capital Adequacy	≥ 15%	12%- 14.99%	8% - 11.99%	7% - 7.99%	≤ 6.99%
Asset Quality Ratio	≤1.5%	≤2.5 – 1.51%	≤ 3.5 – 2.51%	≤5.5% - 3.51%	≥5.51%
Management	≤ 70%	≤75% - 71%	≤80% -76%	≤85% - 81%	≥85%
Earnings – Return on Assets (ROA)	≥1%	0.9% - 0.8%	0.7% – 0.35%	0.34 %– 0.25%	≤0.24%
Return on Equity (ROE)	≥ 20%	15%- 19.99%	12% -14.99%	10 % - 11.99%	≤9.99%
Net Interest Margin (NIM)	≥ 10%	9.99% - 8%	7.99 -6%	5.99%-4	≤ 3.99%
Liquidity Ratio (L1)	≤80%	≤85%- 81%	≤ 90% -86%	≤95% - 91%	≥96%
Liquidity Ratio (L2)	≥ 50%	45% - 49.99%	37% - 44.99%	31% – 36.99%	≤ 30.99%
Sensitivity Ratio	≤25%	32% -26%	39% - 33%	45% - 40%	≥ 46%

Source: Author's Calculations

5.5.1.7.1 Composite Rating

As a standard practice, The Bank of Ghana currently attaches equal weight to each of the six components, making the composite rating an arithmetic average of the individual component ratings.

In this study, however, the composite rating is based on a composite score that is calculated as a weighted score of the components ratings. Weights are assigned to the individual CAMELS components as follows: Capital Adequacy Ratio, 3.5; Asset Quality, 1.5; Management,1; Earnings,3; Liquidity,2; and Sensitivity to Market Risk, 2. Thus, rather than equally weighting, the CAMELS are reconfigured to reflect the current shift in regulation towards capital and broad liquidity needs. A bank's liquidity is functionally affected by the existence of liquid assets (L), quality of earnings (E) and quality of marketable assets(S). The differential weights given here follow the approach of Christopoulos et al. (2011). The use of differential weights also reflects the findings of Agoraki et al. (2011) that capital adequacy requirements and asset quality are more informative as indicators of banking risk compared to measures of profitability, efficiency, and management quality.

The respective weight of each component is then distributed proportionately across the five possible ratings for the given component. To illustrate, the CAR with a weight of 3.5 is spread across the five possible ratings as follows:

- For a CAR rating of 1, the weighted score is 3.5 (that is 100% of the assigned weight for the component);

- For a CAR rating of 2, the weighted score is 2.8 (that is 80% of the assigned weight for the component);
- For a CAR rating of 3, the weighted score is 2.1 (that is 60% of the assigned weight for the component);
- For a CAR rating of 4, the weighted score is 1.4 (that is 40% of the assigned weight for the component); and
- For a CAR rating of 5, the weighted score is 0.7 (that is 20% of the assigned weight for the component).

This process is used to calculate the weighted scores for the other components, using their respective weights given above. The sum of the weighted scores yields the overall composite score for the bank. The maximum composite score is 13 and the least is 2.6. In this case, the higher the composite score, the better the bank. Panel A of Table 5.2 shows the conversion factor table for the weighted scores of the component ratings. The final classification of banks using the composite CAMELS score is summarized in Panel B of Table 5.2.

Table 5.2: Bank Classification using the CAMELS Weighted Scores

Panel A: CAMELS Weighted Component Scores						
CAMELS		Rating 1	Rating 2	Rating 3	Rating 4	Rating 5
Capital Adequacy Ratio		3.5	2.8	2.1	1.4	0.7
Asset Quality		1.5	1.2	0.9	0.6	0.3
Earnings	ROA	1	0.8	0.6	0.4	0.2
	ROE	1	0.8	0.6	0.4	0.2
	NIM	1	0.8	0.6	0.4	0.2
Management		1	0.8	0.6	0.4	0.2
Liquidity	Loan/ Deposit ratio (L1)	1	0.8	0.6	0.4	0.2
	Circulating Assets to Total Assets(L2)	1	0.8	0.6	0.4	0.2
Sensitivity to Market(S)		2	1.6	1.2	0.8	0.4
Total		13	10.4	7.8	5.2	2.6
Panel B: Bank Classification based on Weighted Composite Score						
Composite Rating	Overall CAMELS Composite Score					
1 or Strong	13-10.5					
2 or Satisfactory		10.4 -7.9				
3 or Fair			7.8 -5.3			
4 or Marginal				5.2 -2.7		
5 or Unsatisfactory						≤2.6

Source: Author's Calculations

A composite rating of 1 indicates banks that are sound in every respect. A composite rating of 2 indicates banks that are fundamentally sound but may have modest weaknesses correctable in the normal course of business. A composite rating of 3 means that a bank has a combination of financial, operational or compliance weaknesses ranging from moderately severe to unsatisfactory. A composite rating of 4 means that a bank has an immediate volume of serious financial weaknesses or a combination of other conditions and factors that are unsatisfactory to supervisors. Finally, a composite rating of 5 means that the bank has an extremely high immediate or near-term probability of failure (Bassett et al. 2015).

5.5.2.0 THE Z-SCORE

The second measure of bank stability used in this study is the Z-score.

Following Lepetit and Strobel (2015), the Z-score is measured as $[(ROAA + E/A)] / \sigma(ROAA)$ where ROAA is the bank's return on average assets, E/A denotes the bank's average equity to average asset ratio and $\sigma(ROAA)$ is the standard deviation of return on average assets computed for a five-year rolling window. The average assets and the average equity are computed as the average of the opening figures and their end of year figures, recognising the dynamic nature of each variable as a flow and not static over the period. Using a rolling time window for $\sigma(ROAA)$ allows for time-variation in the standard deviation of the return on assets, and this avoids the Z-score being exclusively driven by changes in ROAA and E/A (Barry et al. 2011). Thus, the Z-score increases with higher profitability and capitalisation levels but declines with

unstable earnings reflected by a higher standard deviation of return on assets (Casu et al. 2015). The Z-score can also be characterised as a combined measure of portfolio risk, and leverage risk. As a robustness check, the Z-score measure is decomposed into its two additive components, namely: *Portfolio Risk* = $\frac{ROAA}{\sigma_{ROAA}}$ and *Leverage Risk* = $\frac{CAR}{\sigma_{ROAA}}$ where CAR is the total equity to total assets ratio (Schooner and Taylor 2010).

The Z-score has been used as a measure of bank stability in the literature because it indicates the distance to default, specifically the number of standard deviations a bank is away from the default barriers, or the point at which losses eliminate equity (Roy 1952). Thus, the larger the Z-score, the longer the distance from the default barriers and hence, the more stable bank is (Barry et al. 2011).

5.5.2.1 The Z-score Scale

Similar to the CAMELS composite ratings, the Z-score is used to rate the banks on a scale of 1 to 5, according to the degree of stability. The overall rating is based on the total Z-score and the leverage ratio, which is the average total equity to average total assets. The five rating categories and their respective threshold scores are given in Table 5.3. The rating scale is developed from the rules and regulations of the US Federal Deposit Insurance Corporation for depository institutions (FDIC 2013).

Table 5.3: Z-Score rating index for Ghanaian Banks

Z- Score Ratings	Total Z-Score	Leverage Ratio or Multiplier
1 or Highly Stable	≥ 10	≤ 5 or up to 20 times or less
2 or Stable	$\geq 8 < 10$	≤ 4 or 20.01 times to 25 times
3 or Fairly Stable	$\geq 6 < 8$	< 4 but ≥ 3 or 25.01 times up to 33 times
4 or Unstable	$\geq 4 < 6$	≤ 3 but ≥ 2 or above 33 times
5 or Significantly Unstable	< 4	≤ 2 or above 50 times

Source: Author's Estimation and FDIC Regulatory Capital Rules Register (2013).

The leverage multiplier measures the number of times the bank's total assets held can be financed by its equity. The lower the leverage multiplier the more stable the bank is. The rating criteria presented in Table 5.3 above could be considered as an enhanced framework for assessing bank stability. It emphasises the need for the existence of appropriate levels of capital to support the bank's investment activities. Thus, besides the Z-score, banks in each category must first satisfy a minimum leverage ratio. Hence, for a bank to be classified as highly stable (rating 1), the bank must have a leverage multiplier of 20 or less and a total Z-score of 10 or more. A stable bank (rating 2) must have a leverage multiplier not exceeding 25 and a total Z-score of at least 8. A fairly stable bank (rating 3) would have a leverage multiplier not exceeding 33 and a total Z-score of at least 6. An unstable bank (rating 4) would have a leverage multiplier not exceeding 50 and a total Z-score of at least 4. A significantly

unstable bank (rating 5) would have a leverage multiplier exceeding 50 and a total Z-score of less than 4. Note that, in the case of the Z-score calculation, the asset base is not risk-weighted; hence the thresholds for the leverage ratios here are lower than those used for the CAMELS ratings in Table 5.1.

5.6.0 MEASUREMENT OF CONTROL VARIABLES: BANK-LEVEL VARIABLES

This section explains how the relevant bank-specific and other control variables that drive bank stability are measured. The bank characteristics include bank size, the mix of financing and lending activity.

5.6.1 Bank Size

The potential candidates for measuring firm size include accounting-based measures such as total assets and total revenue, and market based measures such as market capitalisation (Bhagat et al. 2015).

Following the existing literature, including Dermirguc-Kunt and Huzinga (2011) the research first focuses primarily on total assets on absolute basis. Second, and following Bhagat et al.(2015), bank size is measured as the natural log of the bank's book value of total assets.

5.6.2 External and Interbank borrowing

Following BOG (2014), a bank's portfolio of external and interbank debt is measured as the ratio of the external and interbank debt to total liabilities. The bank's domestic interbank liabilities and external borrowing, includes all

domestic, and the cedi-value of all foreign borrowing. The translation of the foreign borrowings into cedis captures the full effects of currency changes on the bank's debt portfolio, including any potential systemic effects.

5.6.3 Non-Performing Loans (NPLs)

Non-performing loans, in this study, is measured as the ratio of overdue loans to gross loans (Beck et al. 2013). The NPL is estimated from banks' total loans that are classified between substandard, doubtful and loss, in line with Bank of Ghana's classifications. These are usually loans outstanding for more than 90 days after the due period. Using the Bank of Ghana classifications provides a uniform framework for the assessment of non-performing assets across the banks and reduces any measurement errors arising out of some banks recycling their loans, and therefore underestimating the level of their non-performing loans.

5.7.0 MEASUREMENT OF CONTROL VARIABLES: REGULATORY DESIGN VARIABLES

As discussed in Chapter 4, this study also examines the impact of the regulatory environment (both internal and external), on bank stability. The variables considered here are risk governance maturity, regulatory independence of the bank and also the origin of the parent bank. The construction of these variables is described below.

5.7.1 Risk Governance Maturity

The risk governance maturity follows the framework defined by Mongiardino and Plath (2010) and the risk governance index provided by Ellul and Yerramilli (2011). Four out of their five variables reflect the Ghanaian situation and also in line with a bank's risk governance practices and compliance with the Bank of Ghana's risk governance framework, and the BIS best practices. Information from the bank's annual report, validated by information disclosed at AGMs and facts behind the figures at the Securities and Exchange Commission (SEC), where the bank is listed on the Stock Market is checked against the Bank of Ghana and BIS guidelines. These guidelines include less political influence on board membership, the existence of risk committee, measurement and disclosure of value at risk (VaR), and the degree of allocation efficiency based on BOG defined business segments. Full compliance is assigned a score of 4. This implies that a score of 3; 2; and 1 means a bank has satisfied three; two; and one of the defined risk governance requirements respectively.

5.7.2 Regulatory Independence

Following Brei and Schclarek(2013), we construct a dummy variable that takes the value of 1 if the bank is a private bank(or no significant state or quasi –state influence) and 0 if Bank of Ghana, government or other quasi-state institutions, such as SSNIT, State Insurance Company (SIC) and Ghana Cocoa Marketing Board (Cocobod) have a significant shareholding in the bank. Appendix 5.3 shows ownership changes and control of quasi-state institutions in determining regulatory independence.

5.7.3 Origin of banks

The origin of banks is to identify the country, from which the parent bank is licensed. The banks are classified as local or foreign depending on the jurisdiction in which the current parent bank with controlling interest was licensed (Mulyaningsih et al. 2015). Where there have been some acquisitions of local and state-owned banks over the period, compliance with IFRS 3(Revised) Business Combinations is ascertained to validate the change in ownership. Following Claessens and Van Horen(2012) we construct a dummy variable that takes the value of 1 for foreign banks and 0 for local banks.

5.8.0 STATISTICAL ANALYSIS OF THE DATA

This section discusses the statistical methods used in analysing the data collected and to test the various hypotheses developed in Chapter 4. The analysis of the data is in two stages. The first stage, the univariate analysis, involves the use of descriptive statistics, correlation analysis and test of means to explore trends in the bank stability measures and their relationships with bank characteristics. The next is the multivariate analysis which involves the use of panel data methodology to test the various relationships.

5.8.1 UNIVARIATE ANALYSIS

The descriptive statistics provide a broad overview of the data, and the distributional properties of the various variables. These include the mean, median, standard deviation, range of scores, skewness and kurtosis. The

Shapiro- Wilk test for normality is also used to test if the various variables are normally distributed.

The correlation analysis involves pair-wise correlations of the various variables using both the parametric Pearson correlation and the non-parametric Spearman rank correlation. Since the commonly-used Pearson correlation measure can be affected by nonlinearities in the data, the Spearman rank correlation is used to check the robustness of the Pearson correlation measure. If there are no significant nonlinearities in the data, the results from these two measures would be consistent with each other.

An independent t-test is used to determine whether there is a significant difference between two sets of means for two different groups of subjects. In this study, the independent sample t-test is used to test if there are significant differences in the stability characteristics across different bank groups (e.g. foreign versus local banks).

5.8.2 MODEL SPECIFICATION FOR THE MULTIVARIATE ANALYSIS

As noted earlier, this study examines repeated measures of bank stability and their determinants for a cross-section of banks over the period 2009 to 2013. This thesis employs a panel data analytical framework to investigate the relationship between banking stability and regulatory and bank-level risk taking variables. The panel data analytical framework adopted in this thesis is consistent with prior bank stability and regulatory structure studies by Uhde and Heimeshoff(2009), Pathan (2009) and Doumpos et al.(2015) amongst others. In this case, the method of analysis is that of multiple regressions and the

method of estimation may be pooled ordinary least squares (OLS), random effects or fixed effects models as described later in this section. As the data has cross-section and time dimensions, panel data regression analysis is commonly used in the literature to analyse data sets consisting of repeated measures on cross-sectional units such as individuals, firms, or countries, at different points in time.

Initially, the panel data regression model in its general form was estimated as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \dots + \beta_k X_{kit} + U_{it} \dots \dots \dots \text{(Equation 1)}$$

Where:

- Y_{it} is dependent variable
- X_{it} represents explanatory variable
- $i = 1 \dots \dots \dots, N$ firms
- $t = 1 \dots \dots \dots, T$ time periods
- β_0 represents the constant term
- β_1 is the coefficient of the explanatory variables
- U_{it} represents the error term

The error term can further be decomposed into two components in the form of a firm-specific error v_i and an idiosyncratic error ε_{it} . Thus:

$$U_{it} = v_i + \varepsilon_{it} \dots \dots \dots \text{(Equation 2)}$$

The idiosyncratic error term in panel data changes over time and across firms. However, depending on the behaviour of the error term U_{it} and whether the

explanatory variable is serially correlated with the components of the error term v_i and ε_{it} would determine the empirical model specification.

Fundamentally, there are three standard panel data regression models that arise from the general model described in equation (1) above with specific assumptions in relation to the explanatory variables, the properties of the error term, and the association between the explanatory variables and the error term. In addition, further assumptions need to be made regarding the variability of the regression coefficient across firms. In this respect, and as has been indicated earlier, a panel data regression model in this thesis may be estimated by pooled OLS, random effects or fixed effects models and are discussed below.

5.8.2.1 Pooled Ordinary Least Squares (Pooled OLS)

Pooled OLS assumes constant coefficients, that is, referring to both intercepts and slopes. In the event that there is neither a significant firm-specific effect nor significant temporal effects, it could be possible to pool all of the data and run a pooled OLS regression model. Thus the typical assumptions of constant variance (homoskedasticity), exogeneity, observations on the independent variables are not stochastic but fixed repeated samples without measurement errors; and uncorrelated observations (multicollinearity) must continue to hold (Green 2008).

In this thesis the Pooled OLS regression is estimated in the following general form:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + U_{it} \dots \dots \dots \text{Equation 3}$$

Basically, the estimated Pooled OLS regression will be biased because of unobserved heterogeneity (X_{it} and u_{it} are correlated). But the bias may be lower because the Pooled OLS regression relies on between firm comparisons as well as within variation compared to the cross-sectional OLS regression.

5.8.2.2 Random Effects Model (RE)

A random effects model assumes that the unobserved differences are not correlated with any of the explanatory variables. That is, v_i are treated as random constant terms (Green 2012) where the intercept is a random outcome variable. The specific benefit of using the random effects model is that, the regressors allowed time-invariant variables to be included. In this instance, the random error v_i is heterogeneity specific to a cross sectional unit and in this case, banks. This random error is assumed to be constant over time (Schmidheiny, 2014). The equation of the random effects regression becomes:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + v_i + \varepsilon_{it} \quad \dots \dots \dots \text{Equation 4}$$

Where v_i is between-firm error and ε_{it} is within-firm error. Thus, v_i are assumed to be random variables and that $Cov(X_{it}, v_i) = 0$.

But if $Cov(X_{it}, v_i) \neq 0$ the random effects estimator will be biased (Schmidheiny 2014). In this thesis, the Hausman specification test is used to test on whether the random-effects estimator is biased or not.

5.8.2.3 The Fixed Effects Model (FE)

The fixed effects model assumes constant slopes but different intercepts for cross sectional (group) units, and in this case individual banks, thus, the

intercept is the cross section (group) specific that differs from bank to bank. Further, the error term(ε_{it}) is assumed to be correlated with the explanatory variables. Even though there are no significant temporal effects when using fixed effects model, there are significant differences among firms. Thus, the fixed effects model is employed whenever one is only interested in analysing the impact of variables that may vary over time. In this respect, it may be used to explore the relationship between the explanatory variables (bank-level risk taking and regulatory variables) and banking stability within a bank. This means that each bank has its own individual characteristics that may or may not affect the explanatory or the dependent variables.

If these individual characteristics within a bank may impact or bias the explanatory variables or the dependent variables, then one needs to control for these individual firm characteristics.

In this thesis, the fixed effects model is in the following general form:

$$Y_{it} = \beta_1 X_{it} + v_i + \varepsilon_{it} \dots \dots \dots \text{Equation 5}$$

Where v_i is the unobservable firm-specific effect which differs between banks and is time-invariant.

McManus (2011) shows that the fixed effects model is not a panacea for all endogeneity bias such as time –varying unobserved effects, time –varying measurement error, simultaneity or feedback loops. Again time – constant effects are removed in addition to the possibility of providing poor estimates where there is little variation. FE is criticised as trading consistency for efficiency as it uses only within-unit change and ignores between–unit variation.

There is therefore the possibility of parameter estimates being imprecise leading to large standard errors.

5.9.0 THE BENEFITS OF USING PANEL DATA ANALYSIS TECHNIQUES

Hsiao (2007) discusses the typical benefits and challenges of using the panel data framework. The benefits include a greater number of data points, which increases the degrees of freedom, provides more variability in the sample data set, and leads to more reliable parameter estimates and accurate statistical inferences. The use of a panel data framework also offers the opportunity to control for unobserved individual specific effects in the data set. The empirical models used and their estimation processes are discussed below.

5.10 THE CHOICE OF EMPIRICAL MODEL SPECIFICATION

For the purpose of empirical model specification for data analysis, the assumptions of panel regression need to be tested in order to determine the best fit empirical model specification for the unique data set used in this thesis. The Breusch and Pagan (1980) Lagrange Multiplier is used in this thesis to choose between pooled OLS regression and the alternatives of random effects and fixed effects models.

Pathan (2009) suggests that the test could be used to determine whether or not there is heterogeneity. If the pooled OLS estimator is found to be inconsistent and biased due to unobserved variables, then, the choice between random effects model or fixed effects model is decided by the Hausman specification test to help distinguish between the consistency and efficiency of the

estimators. Fundamentally, if this thesis employs pooled OLS regression and the unobserved variables are uncorrelated with the error term (u_{it}) and the independent variables when the random effects regression is suitable, the OLS estimator will be consistent but not efficient. However, if there are no unobserved variables which are unlikely to hold in this thesis, then OLS will be efficient. Otherwise, the random effects regression will be more consistent and efficient.

In the same vein, if a pooled OLS regression is employed when a fixed effects regression is suitable, the OLS estimator will be inconsistent while the fixed effects model will be consistent. Also, if a random effects regression is used when fixed effects regression is suitable, then the random effects model will be inconsistent. In this respect, one needs to be very careful in choosing a suitable estimator in this thesis.

Following that, the Hausman specification test will be used to distinguish between random effects and fixed effects regressions for the empirical analysis in Chapter 7. The Hausman test assumes that the individual and/or time effects are not correlated with the independent variables, in which case the random effects model would be suitable. This assumption is tested against the alternative of the presence of fixed effects in the data set. If there are fixed effects, then estimates from the random-effects model will be biased and inconsistent and, therefore, unsuitable. Hence, if the null of the Hausman test is rejected, then the fixed effects estimation would be used. It is however argued, that failure to reject the null hypothesis in the Hausman test does not necessarily mean the random effects assumption is true.

An alternative to the Hausman test is the Breusch-Pagan test proposed by Breusch and Pagan (1980). However, Moulton and Randolph (1989) show that the asymptotic properties of this test statistic can be poor, even in large samples. Given the relatively small sample size in this study and the fact that none of these specification tests is fully efficient, the asymptotic properties of these tests may not hold for this sample. Hence, the results from the specification tests should be interpreted with caution.

5.11 THE EMPIRICAL MODEL

The empirical model follows Uhde and Heimeshoff(2009) and Battaglia and Gallo(2015). The empirical specification of the basic model used in this study is as follows:

$$Z_{it} = a_0 + a_1 S_{it} + a_2 L_{i,t} + a_3 N_{it} + a_4 R_{it} + a_5 I_{it} + a_6 OR_i + w_{it} \quad \text{Equation 6}$$

Where:

- Z_{it} is the natural log of the Z-score and the dependent variable (DV)
where i = entity or bank and t = time period
- S_{it} is a bank size, expressed in natural log form
- $L_{i,t}$ is interbank liabilities to total liabilities ratio
- N_{it} is Non Performing Loans to Total Gross Loans ratio
- R_{it} is the index rating variable for Risk Governance
- I_{it} is the indicator variable for Regulatory Independence
- OR_i is an indicator variable for origin of the foreign bank
- $a_i, i = 1, 2, \dots, 6$ are the respective slope coefficients
- w_{it} is the error term and

- α_0 is the intercept.

5.12 ROBUSTNESS TEST OF RESULTS

The generalised method of moments (GMM) estimation for linear and non-linear models was formalised by Hansen (1982). Following Hayashi (2000) the linear regression model in equation 7 is expressed as

$$y_t = z_t' \delta_0 + \varepsilon_t, t = 1, \dots, n \quad \text{Equation 7}$$

where z_t is an $L \times 1$ vector of explanatory variables, δ_0 is a vector of unknown coefficients and ε_t is a random error term. y_t is the dependent variable.

Equation 7 allows for the possibility that some or all of the elements of z_t may be correlated with the error term ε_t i.e., $E[z_{tk} \varepsilon_t] \neq 0$ for some k , the number of instrumental variables. If $E[z_{tk} \varepsilon_t] \neq 0$ then z_{tk} is an endogenous variable. It is well known that if z_t contains endogenous variables, then the least squares estimator of δ_0 in equation 7 is biased and inconsistent.

In Equation 7, it is assumed that there exists a $K \times 1$ vector of instrumental variables x_t which may contain some or all of the elements of z_t . We let w_t represent the vector of unique and non-constant elements of $\{y_t, z_t, x_t\}$. It is assumed that $\{w_t\}$ is a stationary and ergodic stochastic process.

The instrumental variables x_t satisfy the set of K orthogonality conditions:

$$E[g_t(w_t, \delta_0)] = E[x_t \varepsilon_t] = E[x_t (y_t - z_t' \delta_0)] = 0 \quad \text{Equation 8}$$

where $g_t(w_t, \delta_t) = x_t \varepsilon_t = x_t (y_t - z_t' \delta_0)$. Expanding (Equation 8), gives the relation

$$\Sigma_{xy} = \Sigma_{xz} \delta_0$$

where $\Sigma_{xy} = E[x_t y_t]$ and $\Sigma_{xz} = E[x_t z_t']$. For identification of δ_0 , it is required that the $K \times L$ matrix $E[x_t z_t'] = \Sigma_{xz}$ be of full rank L . This rank condition ensures that δ_0 is the unique solution to (Equation 8). Note, if $K = L$, then $\Sigma_{xz} \Sigma_{xz}$ is invertible and δ_0 may be determined using $\Sigma_{xz}^{-1} \Sigma_{xy}$ (Hayashi 2000).

A necessary condition for the identification of δ_0 is the order condition

$$K \geq L \quad \text{Equation 9,}$$

which simply states that the number of instrumental variables must be greater than or equal to the number of explanatory variables in (Equation 7). If $K = L$ then δ_0 is said to be (apparently) just identified; if $K > L$ then δ_0 is said to be (apparently) over-identified; if $K < L$ then δ_0 is not identified.

In other words, the rank condition $\text{rank}(\Sigma_{xz}) = L$ Equation 10 , must also be satisfied for identification.

In the regression model (Equation 7), the error terms are allowed to be conditionally heteroskedastic as well as serially correlated. For the case in which ε_t is conditionally heteroskedastic, it is assumed that $\{g_t\} = \{x_t \varepsilon_t\}$ is a stationary and ergodic martingale difference sequence (MDS) satisfying

$E[g_t g_t'] = E[x_t x_t' \varepsilon_t^2] = S$ where S is a non-singular $K \times K$ matrix. The matrix S is the asymptotic variance-covariance matrix of the sample moments $\bar{g} = n^{-1} \sum_{t=1}^n g_t$ ($w_t \delta_0$) (Hayashi, 2000).

This follows from the central limit theorem for ergodic stationary martingale difference sequences (Hayashi, 2000):

$$\sqrt{n} \bar{g} = \frac{1}{\sqrt{n}} \sum_{t=1}^n x_t \varepsilon_t \xrightarrow{d} N(0, S)$$

where $\text{avar}(\bar{g}) = S$ denotes the variance-covariance matrix of the limiting distribution of $\sqrt{n}\bar{g}$. For the case in which ε_t is serially correlated and possibly conditionally heteroskedastic as well, it is assumed that $\{g_t\} = \{x_t \varepsilon_t\}$ is a stationary and ergodic stochastic process that satisfies

$$\sqrt{n}\bar{g} = \frac{1}{\sqrt{n}} \sum_{t=1}^n x_t \varepsilon_t \xrightarrow{d} N(0, S)$$

$$S = \sum_{j=-\infty}^n \Gamma_j = \Gamma_0 + \sum_{j=1}^{\infty} (\Gamma_j + \Gamma_j')$$

Where $\Gamma_j = E[g_t g_{t-j}'] = E[x_t x_{t-j}' \varepsilon_t \varepsilon_{t-j}]$. In the above, $\text{avar}(\bar{g}) = S$ is also referred to as the long-run variance of \bar{g} (Hayashi 2000).

To compute any of the efficient GMM estimators, a consistent estimate of $S = \text{avar}(\bar{g})$ is required. The method used to estimate S depends on the time series properties of the population moment conditions g_t . If the population moment conditions $g_t(\theta_0)$ are an ergodic-stationary but serially correlated process then

$$S = \text{avar}(g) = \Gamma_0 + \sum_{j=1}^{\infty} (\Gamma_j + \Gamma_j') \quad \text{where } \Gamma_j = E[g_t(\theta_0) g_{t-j}(\theta_0)'].$$

In case of heteroskedasticity and autocorrelation consistent (HAC) estimate of S has the form:

$$\hat{S}_{HAC} = \frac{1}{n} \sum_{j=1}^{n-1} w_{j,n} (\hat{\Gamma}_j(\hat{\theta}) + \hat{\Gamma}_j'(\hat{\theta}))$$

where $w_{j,n}$ ($j = 1, \dots, b_n$) are kernel function weights, b_n is a non-negative bandwidth parameter that may depend on the sample size,

$\hat{\Gamma}_j(\hat{\theta}) = \frac{1}{n} \sum_{t=j+1}^n g_t(\hat{\theta}) g_{t-j}(\hat{\theta})'$, and $\hat{\theta}$ is a consistent estimate of θ_0 . A standard

of correcting the presence of potential heteroskedasticity and autocorrelation in the panel data is by using heteroskedasticity and autocorrelation consistent (HAC) standard errors proposed by Newey and West (1987). Therefore to make the results robust to heteroskedasticity and autocorrelation the robust and HAC Bartlett-Newey West kernel options are specified when using the STATA Generalised Method of Moments (GMM).

The independent variables are instrumented and by using the `wmatrix` and variance-covariance (`vce`) options appropriate that allows either for errors that are independent and identically distributed; or are independent but not identically distributed that exhibit heteroskedasticity and autocorrelation. The `wmatrix` specifies the type of weight matrix to be used in conjunction with the two-step and iterated GMM estimators. The validity of the instruments is tested using the Hansen's J test statistic of overidentifying restrictions. In all cases, the test statistic accepts the null hypothesis that the instruments are exogenous (Roodman 2006).

5.13 OAXACA – BLINDER DECOMPOSITION TECHNIQUE

The STATA software is used to undertake the decomposition of the differences in the stability scores between the foreign and the local banks. This procedure known in the literature as the Blinder – Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973) divides the stability differentials between the local and foreign banks into a part that is 'explained' by group differences in performance or risk taking and productivity characteristics such as size, NPLs, debt and interbank borrowing, compliance with regulations and a residual part that cannot be accounted for by such differences in bank system stability. The unexplained

part is often used as a measure of discrimination for policy preference, but it also subsumes the effect of group differences in unobserved predictors. In other words, the Blinder- Oaxaca will be used to assess how much of the gap in Z-scores between the foreign and local banks is due to characteristics (explained variable) and how much is due to policy or system changes (unexplained variable). The reason is to find out how much of the mean outcome difference, is accounted for by group differences in the predictors.

Empirically, Basset et al. (2015), who examined whether the standards used to assign commercial banks CAMELS have changed materially over time from 1991 -2013 in the USA, used the Blinder-Oaxaca decomposition method to disaggregate bank conditions into ‘composition’ component and ‘risk’ component.

Jann (2008) shows the methods and formulae as follows: given two groups local banks (A) and foreign banks (B), an outcome variable Y and a set of predictors, the difference in the mean outcome is defined as

$$R = E(Y_A) - E(Y_B) ; \quad \text{Equation 11 .}$$

Where:

- R is the difference in the mean outcome
- (Y_A) is the expected value of local banks outcome variable
- $E(Y_B)$ is the expected value of foreign banks outcome variable

The expected value of each outcome variable is accounted for by group differences in the predictors.

Based on the linear model:

$$Y_l = X_l' \beta_l + \epsilon_l, \quad E(\epsilon_l) = 0, \quad l \in \{A, B\} \quad \text{Equation 12.}$$

Where:

- Y_l is the dependent variable or log of Z-scores of local(A) and foreign(B) banks in Ghana
- X is a vector containing the predictors(bank size, bank borrowing, NPL, risk governance, regulatory independence and ownership)
- β is a constant which contains the slope parameters and the intercept
- ϵ is the error term
- $l = 1, \dots, N$ banks

The mean outcome difference can be expressed as the difference in the linear prediction at the group-specific means of the regressors (Jann 2008:2).

$$\text{That is: } R = EY_A - EY_B = E(X_A)' \beta_A - E(X_B)' \beta_B \quad \text{Equation 13}$$

$$\text{Since, } E(Y_l) = E(X_l' \beta_l + \epsilon_l) = E(X_l' \beta_l) + E(\epsilon_l) = E(X_l)' \beta_l \quad \text{Equation 14}$$

with $E(\beta_l) = \beta_l$ and $E(\epsilon_l) = 0$ by assumption.

Jann (2008) contends that the identification of the contribution of group differences in predictors to the overall outcome difference in equation 13 can be rearranged as shown in Equation 15 below.

$$R = [E(X_A) - E(X_B)]' \beta_B + E(X_B)' (\beta_A - \beta_B) + [E(X_A) - E(X_B)]' (\beta_A - \beta_B) \quad \text{Equation 15}$$

The rearrangement results in a ‘three-fold’ decomposition or the outcome difference is divided into three parts: $R = E + C + I$ (Jann 2008:2).

The first summand $E = [E(X_A) - E(X_B)]' \beta_B$ amounts to the part of the differential that is due to group differences in the predictors (the “endowment effect”). The second component $C = E(X_B)' (\beta_A - \beta_B)$ measures the contribution

of differences in the coefficients (including differences in the intercept). The third summand $I = [E(X_A) - E(X_B)]'(\beta_A - \beta_B)$ is the interaction term accounting for the fact that differences in endowment and coefficients exist simultaneously between the two groups (Jann 2008:3).

Jann (2008) further explains that the Equation 15 is formulated from the viewpoint of foreign banks (Group B). This means that the group differences in the predictors are weighted by the coefficients of foreign banks to determine the endowment effect (E) which measures the expected change in foreign banks' mean outcome, if foreign banks had local banks' predictor levels. Similarly, the second component (C), the differences in coefficients are weighted by foreign banks' predictor levels, which measure the expected change in foreign banks' mean outcome if foreign banks had local banks' coefficients.

Alternatively, Equation 16 is formulated from the viewpoint of local banks (Group A). The endowment effect amounts to the expected change of local banks' mean outcome, if local banks had foreign banks' predictor levels. The coefficient effect quantifies the expected change in local banks' mean outcome if they had foreign banks' coefficient. Following Jann (2008: 3), this reverse three-fold decomposition can also be expressed as:

$$R = [E(X_A) - E(X_B)]'\beta_A + E(X_A)'(\beta_A - \beta_B) - [E(X_A) - E(X_B)]'(\beta_A - \beta_B) \text{ Equation 16}$$

The first summand $E = [E(X_A) - E(X_B)]'\beta_A$ amounts to the part of the differential that is due to group differences in the predictors (the “endowment effect”). The second component $C = E(X_A)'(\beta_A - \beta_B)$ measures the contribution of differences in the coefficients (including differences in the intercept). The

third summand $I = [E(X_A) - E(X_B)]'(\beta_A - \beta_B)$ is the interaction term accounting for the fact that differences in endowment and coefficients exist simultaneously between the two groups (Jann 2008:3).

The main limitation to Blinder – Oaxaca has been the need to have only two groups to compare. However, the comparison of foreign and local banks stability is the basis of this research and makes its application very relevant.

5.14 CHAPTER SUMMARY

This chapter has discussed data considerations and analysis procedures adopted in this thesis with particular emphasis on data collection procedures and the method of analysis in achieving the thesis objectives. First, it attempted to describe the data, sample and the development of the composite CAMELS and the Z-score where the sources of data were comprehensively explained. The scoring methods are then described and discussed.

Second, the independent variables were discussed. The linear GMM model is suggested to test the robustness of the results. The result from the statistical tests employed will be discussed in the next two chapters.

CHAPTER 6

UNIVARIATE ANALYSIS

6.1 INTRODUCTION

This chapter uses descriptive statistics to compare changes in stability trends from 2009 to 2013. The chapter seeks to achieve three objectives. First, is to examine the differences in the measures of stability between the foreign and local banks. Second, is to ascertain if the CAMELS and the Z-score measures of bank stability report the same level and pattern of bank stability in Ghana as stated in chapter 1. Third, is to identify the implications of the findings for banking sector management in Ghana.

6.2 COMPARATIVE DESCRIPTIVE STATISTICS FOR CAMELS

A summary of the descriptive statistics of CAMELS variables of the sampled 20 banks is presented in Table 6.1. The table reports the mean, minimum and maximum values for these variables over the sample period. All the values are reported in percentages.

Table 6.1 becomes meaningful when it is integrated into the results reported in Table 6.2. Figures 6.1 to 6.9 show the distribution of the CAMELS variables across the 20 banks for the period 2009 – 2013. For all the column charts shown, the first eleven banks on the horizontal axis are the foreign banks in Ghana. The remaining nine banks are the local or Ghanaian-owned banks. In Chapter 2, the comparative analysis of the capital adequacy, asset quality of the entire Ghanaian banking sector and other sub-Saharan African countries were presented.

Table 6.1**Summary Statistics on CAMELS Variables of 20 banks from 2009- 2013****(Values reported are in percentages)**

Variable		Mean	Minimum	Maximum
Capital Adequacy Ratio (CAR)		20.7	10.0	74.3
Asset Quality(AQ)		12.3	1.0	48.0
Management (M)		59.1	27.3	116.0
Earnings	Return on Assets (ROA)	2.5	-4.3	7.0
	Return on Equity(ROE)	18.3	-21.1	51.2
	Net Interest Margin (NIM)	9.2	3.4	17.3
Liquidity	Loan/ Deposit Ratio (L1)	70.2	14.0	128.0
	Circulating Assets to Total Asset Ratio(L2)	47.0	18.0	96.0
Sensitivity to Market Risks(S)		26.0	0.01	77.0

Source: Authors Calculations

The comparative analysis in this chapter takes into account two other countries because of the significant role the banks from Nigeria and South Africa are playing in Ghana. South African banks currently control over 16.2% of Ghana's banking assets. This figure is more than 6% of Ghana's GDP (IMF 2014b) which implies that their failure would constitute a systemic financial crisis in Ghana (Casu et al. 2015).

Table 6.2 below integrates the key results in Table 6.1 and provides a comparative analysis of the financial soundness or CAMELS variables of Ghana (using the author's figures) compared with those from South Africa and Nigeria over the period from 2009 to 2013.

Table 6.2

**Comparative CAMELS Variables of 20 sample banks from 2009- 2013 and
Country CAMEL variables of South African and Nigerian Banks**

(Values reported are in percentages)

Country		Ghana	South Africa	Nigeria
Variable		Mean of 20 sampled banks	Mean (all banks)	Mean(all banks)
Capital Adequacy Ratio (CAR)		20.7	15.8	10.8
Asset Quality(AQ)		12.3	4.82	11.16
Management (M)		59.1	55.6	50.63
Earnings	Return on Assets (ROA)	2.5	1.32	-0.66
	Return on Equity(ROE)	18.3	18.66	-32.92
	Net Interest Margin (NIM)	9.2	3.4	17.3
Liquidity	Loan/ Deposit Ratio (L1)	70.2	50.2	59.07
	Circulating Assets to Total Asset Ratio(L2)	47.0	16.6	21.1
Sensitivity to Market Risks(S)		26.0	Not Available	Not Available
Source: Author's Calculations from IMF Country Report No. 14/340 on South Africa; IMF Country Report No. 14/103 on Nigeria; World Development Indicators (WDI), 2015; Moyo et al. 2014.				

The comparative results show that the sampled 20 Ghanaian banks on average have a higher percentage of NPLs (asset quality (AQ)) than their peers in Nigeria. Again Nigerian banks on average generate a higher NIM than the sampled Ghanaian banks. The reasons are that the Nigerian banking sector experienced banking crisis in 2009 and therefore sanitised its regulatory regime by increasing Nigerian banks' capital base, strengthened deposit insurance monitoring, and shifted from universal to specialised licensing regime (Ikpefan 2012). Again, the Nigerian banks show a lower ratio of non-interest operating

expense to operating income than the sampled Ghanaian banks. The Ghanaian banks however have a higher capital adequacy levels, liquidity (LIQ 1 and LIQ 2), ROA and ROE than their peers in Nigeria. Overall, the Ghanaian banks appear to be more stable than the Nigerian banks with the average capital adequacy level almost double that of the Nigerian banks in percentage terms. However, these conclusions should be used with caution because they are based on percentages and have practically ignored the relative absolute capital amounts, absolute size of banks, currency value to the dollar and relative stability of the economic environment.

However, comparison with South African CAMEL show mixed results. The Ghanaian banks appear to be more liquid, earn a higher net interest margin (NIM) but show a lower asset quality level, a higher operating cost to operating income and loan to deposit ratios. In terms of stability, the results show that South African banking variables indicate a more stable banking sector than that of Ghana because they show a higher asset quality level. This can partly be attributed to South Africa's ability to implement the key Base II disclosure requirements. The regulatory regime is therefore very stringent on the degree of how banks disclose and write –off of their bad loans. South African banks also have a lower operating cost to operating income than the sampled Ghanaian banks. The market sensitivity comparison is excluded for lack of data.

The operating cost to income ratio reported for sampled Ghanaian banks is the highest among the three countries (see also Moyo 2014), may be attributed negatively to management inefficiency (Klomp and De Haan 2012). It may also

be attributed positively to 'profit mining' (a positive form of tunnelling) to create funds to be recycled for future nominal capital increases.

6.3.0 GRANULAR ANALYSIS OF SAMPLE GHANAIAN BANKS' CAMELS

The granular analyses of the 20 sampled banks' CAMELS are presented in this section to illustrate the results of their individual bank-level risk taking as compared with peers in the sample.

6.3.1 CAPITAL ADEQUACY RATIO (CAR)

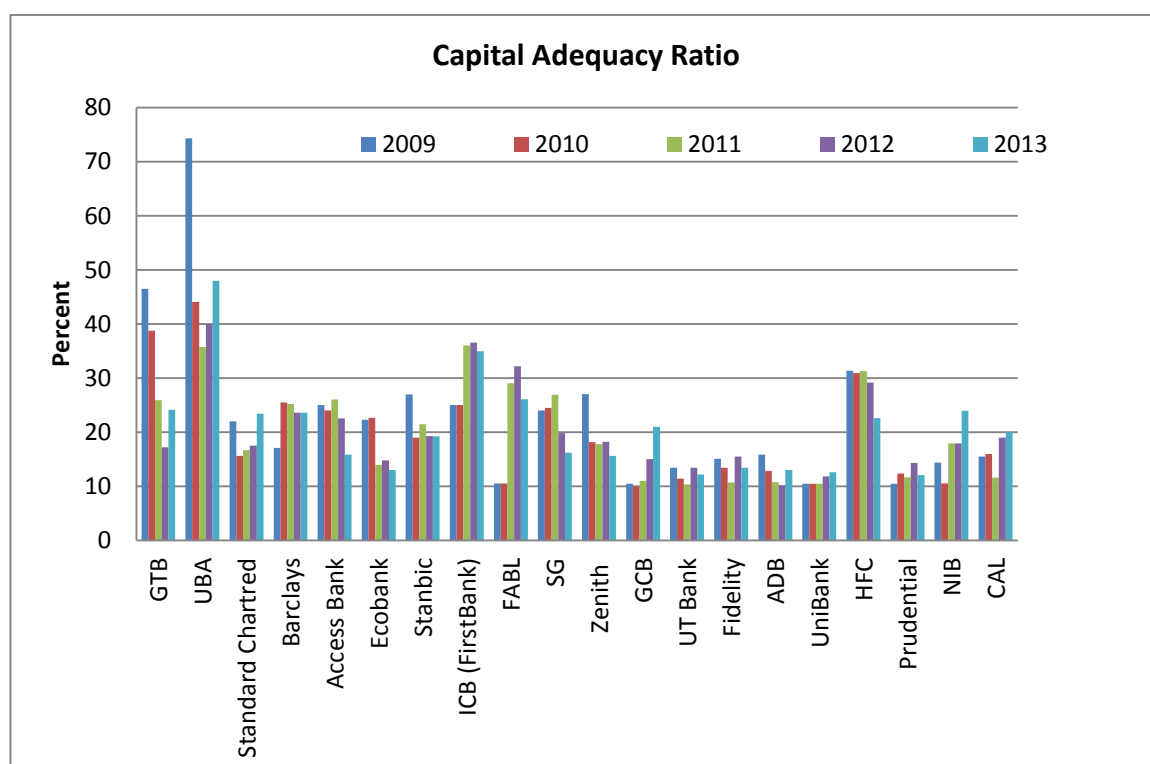
The mean capital adequacy ratio across all banks over the sample period is 20.7. Thus, on average the banks have healthy capital adequacy ratios. However, using the average measures can mask the differences in the banks' capital adequacy ratios.

The minimum and maximum CAR values are 10 % and 74.3 % respectively for the sample banks. Thus, while some banks have very high CARs, others have relatively lower CARs but all the banks satisfied the minimum capital adequacy ratio of 10% required by the regulatory authorities in Ghana.

Figure 6.1 represents the distribution of the CARs for the sample banks over the study period reported.

Figure 6.1

Sample Bank Capital Adequacy Ratio of 20 banks from 2009 -2013 in Ghana



Source: Author's illustration

Although none of the banks breaches the minimum capital adequacy ratio of 10% over the period, differences in the capital adequacy ratios across banks are clear. And, even for the same bank there are some wide variations from year to year.

6.3.2 ASSET QUALITY (AQ)

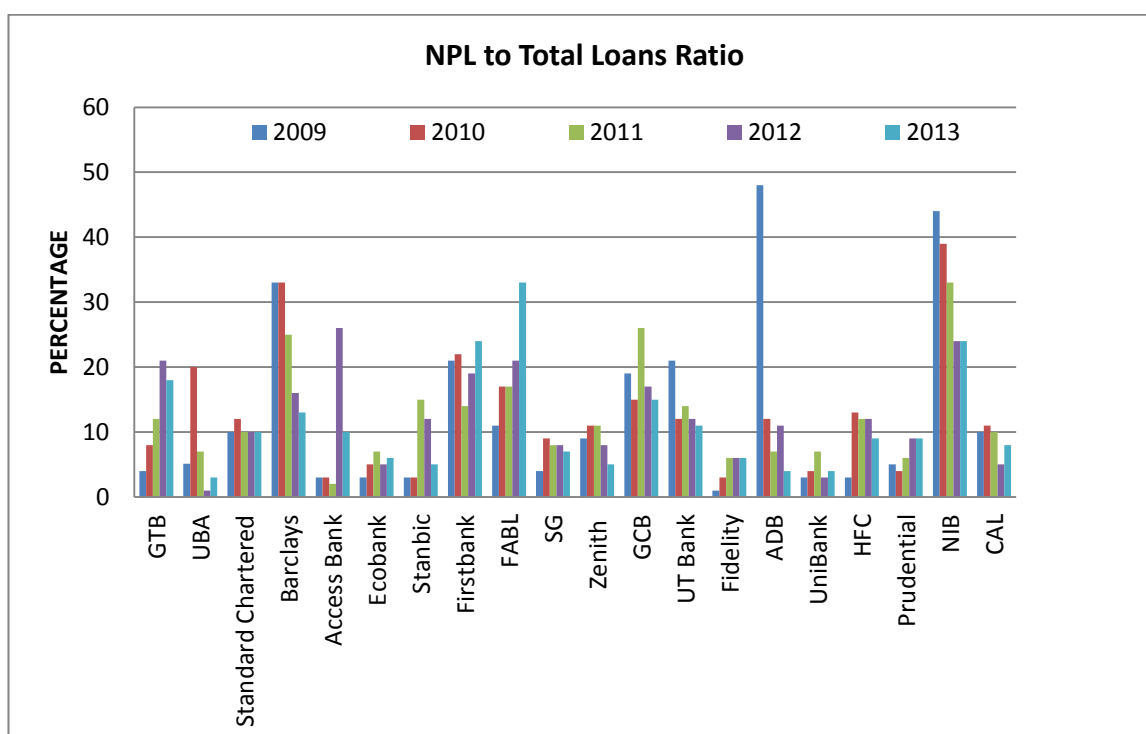
The quality of assets or non-performing loans stood at 12.3 % on average from 2009 to 2013. The minimum and maximum NPL values reported were 1% and 48 % respectively for the sample banks. It shows the relative performance of both foreign and local banks in managing their loan default risks over the period

of study. Figure 6.2 represents the distribution of the NPLs for the sample banks over the study period reported. All the banks breached the regulatory allowable non-performing loans level of 1% over the period. There are differences in the NPLs across banks and even for the same bank, there are some wide variations from year to year depending on risks inherent in the segments the bank in question has concentrated its loan portfolios.

The Bank of Ghana's response has been the introduction of loan-write off disclosure notice with the primary aim of minimising the risk of recycling of loans. Second has been the establishment of loan trusts for the state-owned banks to ensure the recovery of some of the loans and possible sale of the bank to private investors. These measures have failed largely because the allocation of loans in state-owned banks are still directed at meeting political ends, while the privately-owned banks are equally affected by the weak macroeconomic environment which is largely driven by government expenditure.

Figure 6.2

Individual Asset Quality (NPL ratios) from 2009 to 2013



Source: Author's Presentation

Again the measures do not have penalties that lead to changes in organisations that put managers job at risk as suggested by Shehzad and De Haan(2015).

This trend is likely to worsen given the decline in international oil prices as an emerging source of foreign exchange and a tool for sovereign guarantee of loans. Compared to peers in sub-Sahara Africa as shown in Chapter 2, asset deterioration is relatively high.

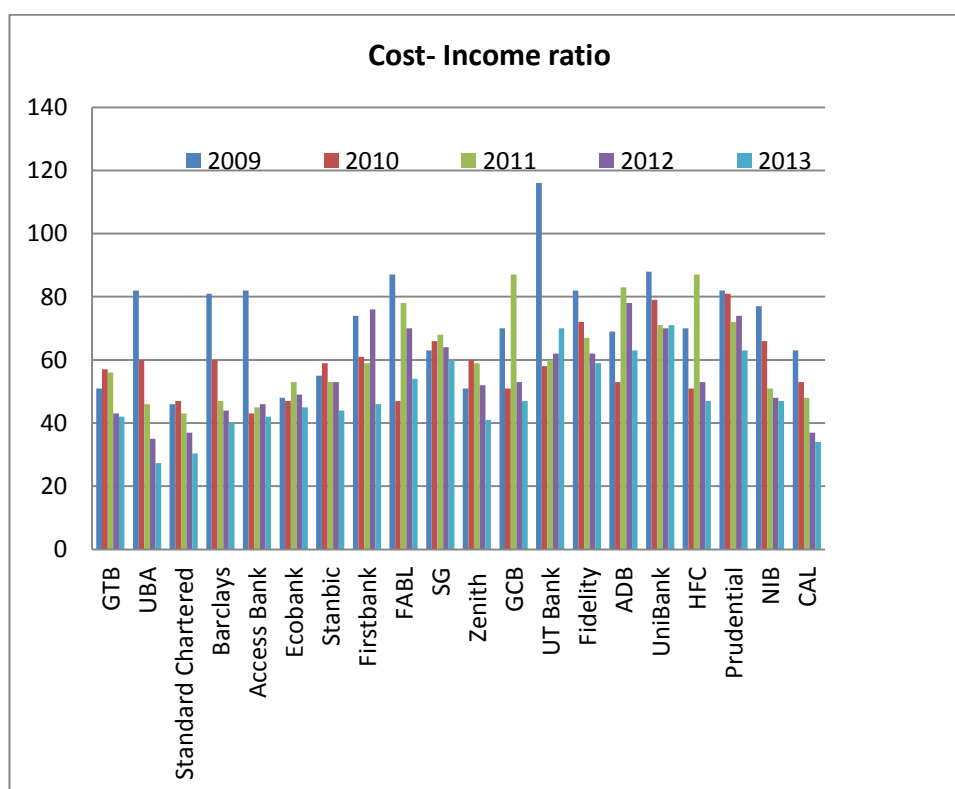
The effectiveness of these measures had been undermined by the continued political influence on the management of these institutions, weak management capacity to prevent continued tunnelling of resources.

6.3.3 MANAGEMENT

The mean cost-income ratio across all banks over the sample period is 59.1. Moyo et al. (2014) show that the average cost –income ratio across 18 countries including Ghana in sub-Saharan Africa from 2008 to 2011 was 58.33. Thus, on average the banks in Ghana have relatively higher cost to income ratios. The high cost to income ratio in Ghana is explained by the lack of scale economies due to the small system and average bank size (IMF, 2011) and currently partly due to tunnelling. The minimum and maximum cost-income values are 27.3% and 116% respectively for the sample banks. Figure 6.3 represents the distribution of the cost –income ratios for the sample banks over the study period reported. All the banks show high cost-income ratios which indicate high operating costs and rigidities in their cost structure. The high cost-income ratios have the potential to also reduce the banks' flexibility to respond to a changing macro-environment. High staff costs and cost of extending branch network reduce their ability to reduce administrative expenses. Except for UT Bank, all the banks have taken steps to reduce their cost to income ratios after 2011.

Figure 6.3

Management (cost-income) ratio of 20 banks from 2009 to 2013



Source: Author's Presentation

6.3.4 EARNINGS

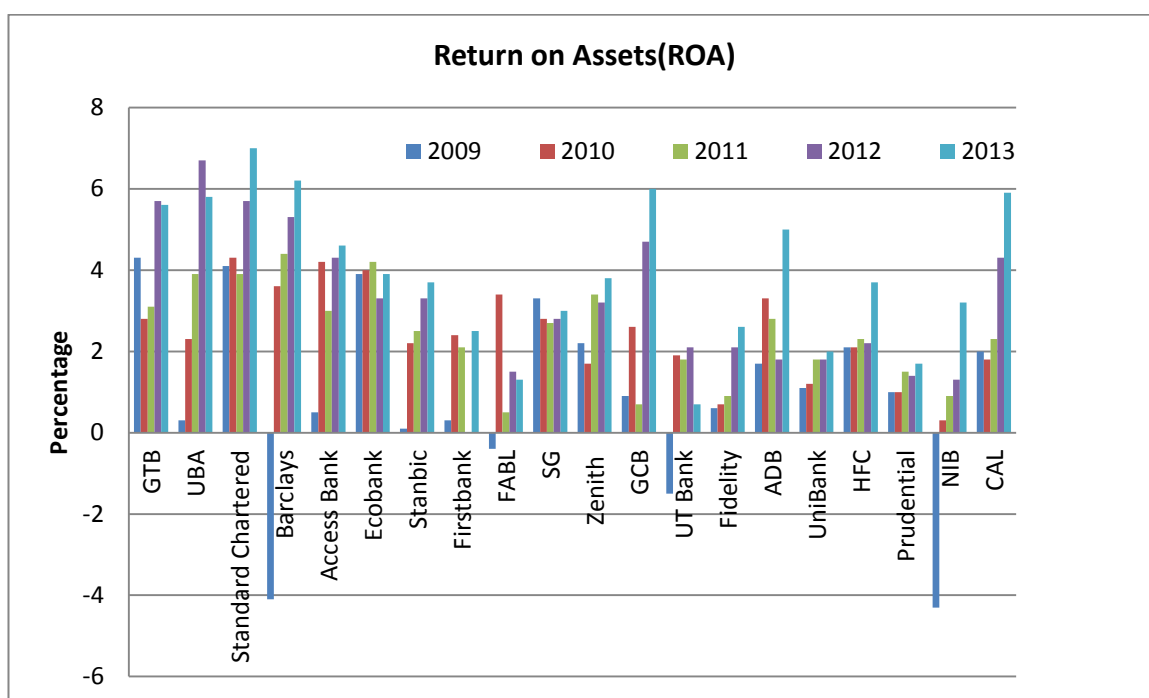
6.3.4.1 Return on assets (ROA)

The mean value for return on assets (ROA) was 2.5 %. The minimum and maximum ROA values reported were – 4.3 % and 7 % respectively for the sample banks in the period of study. The data shows that the reported ROA of banks depends on the profitability of banks in that particular year. The year 2009 shows that four banks had negative ROA because they declared huge losses and post-2009 period shows significant improvement in the performance

of banks. Figure 6.4 shows the distribution of banks' generated returns on their assets in the period of study.

Figure 6.4

Return on Assets of 20 banks from 2009 to 2013



Source: Author's Presentation

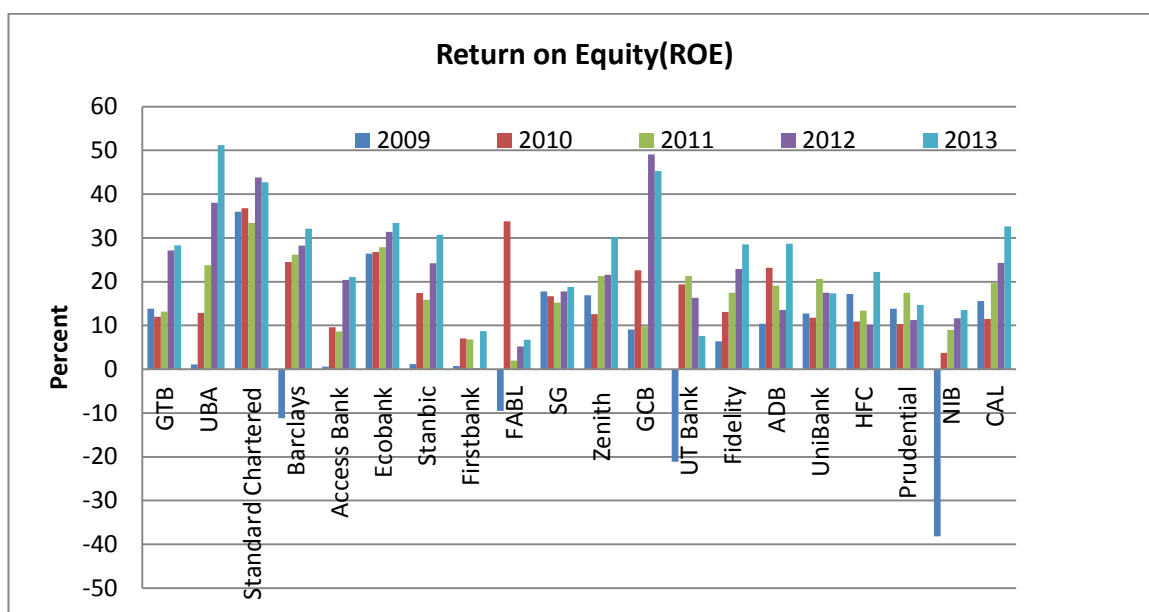
6.3.4.2 Return on Equity (ROE)

The mean value for return on equity was 18.3%. The minimum and maximum ROE values reported were -21.1% and 52 % respectively for the sample banks in the period of study. The data reported negative ROEs in 2009 when four of the sampled banks reported losses in that financial year. Variation in ROEs, therefore, follows the profit trends and the level of new equity injections into banks. Figure 6.5 shows the distribution of banks' returns on shareholders' funds by sample banks in the study period. The pattern of distribution shows

that return to shareholders by individual banks has consistently improved after 2009. This is explained by the fact that while nominal profit after tax declared by the banks were increasing year after year, the level of retentions and new capital or equity injections were not increasing in tandem due to multiple and in some cases extra dividend policies being pursued by all the banks. The effect of such dividend policy arrangements accounted for high ROEs of banks in 2012 and 2013.

Figure 6.5

Return on Equity of 20 banks from 2009 – 2013



Source: Author's Presentation

6.3.4.3 Net Interest Margin (NIM)

The mean value for Net Interest Margin (NIM) was 9.2 %. The minimum and maximum NIM statistics reported were 3.4% and 17.3 % respectively for the sample banks in the period of study. The data shows differences in the

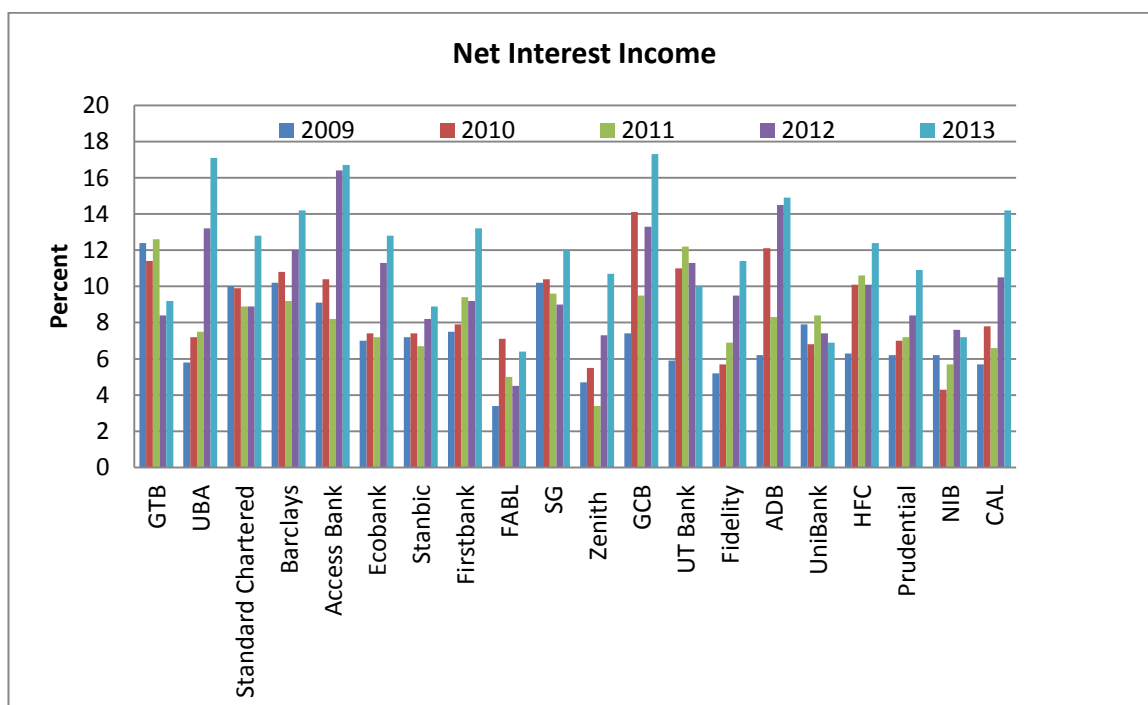
interest margins reported by sample banks. Figure 6.6 shows the distribution of individual banks' returns over their cost of lending by sample banks in the study period.

The margins reported by the banks are generally positive. However, there are variations in individual bank's NIM, which shows the differences that exist among banks in their bank-deposit and bank-credit markets. The cross-sectional data shows some mixed results that, except for 2009 and 2013, local banks on average achieved a higher net interest margin than their foreign competitors in the period of study.

The results also show that banks have responded to changing market conditions and have priced their loans to reflect the underlying risks effectively. In other words, the banks have chosen their segments carefully, and business and pricing strategies do reflect the level of risks in these segments.

Figure 6.6

Net Interest Income of 20 banks for 2009 to 2013



Source: Author's Presentation

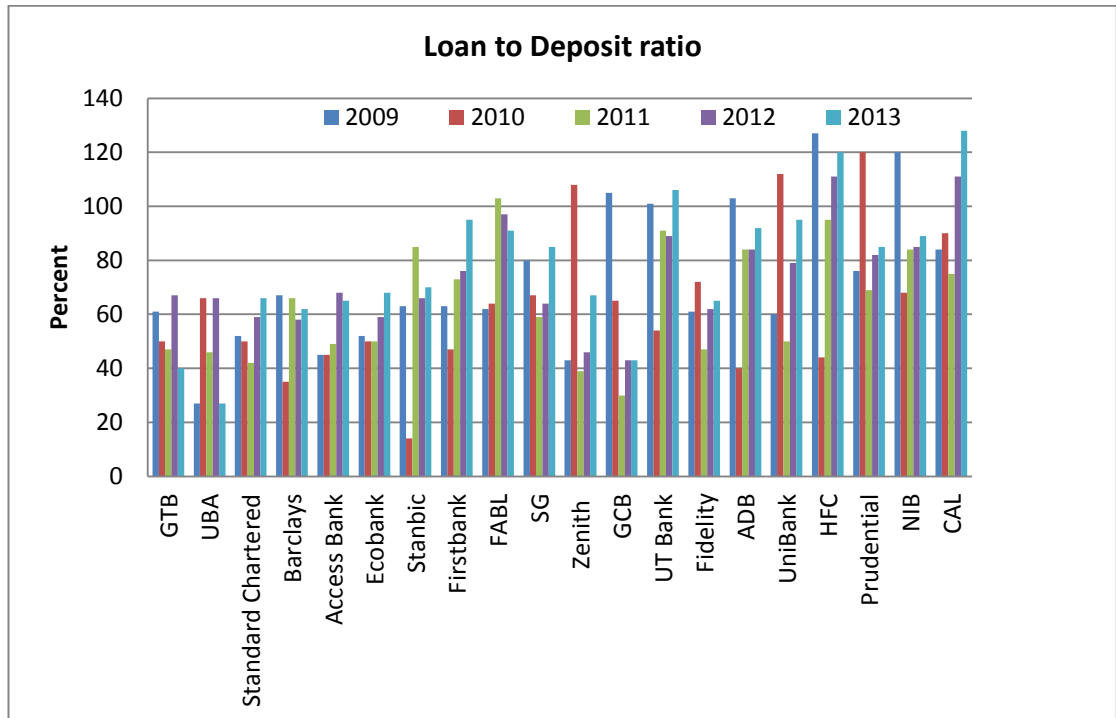
6.3.5 LIQUIDITY

6.3.5.1 Liquidity: Loan to Deposit ratio (LI)

The mean value for the loan to deposit ratio was 70.2 %. The minimum and maximum LI values reported were 14 % and 128 % respectively for the sample banks in the period of study. Figure 6.7 shows an individual bank's funding of loans from deposits mobilised over the study period from 2009 to 2013.

Fig. 6.7

Loan deposit ratio of 20 banks from 2009 to 2013



Source : Author's Presentation

The data on individual banks shows variations in the loan to deposit ratios of sampled banks.

Except for FABL and Zenith Bank, in pre-2011 period that exceeded 100 per cent of their loan to deposit ratios, the remaining foreign banks have funded their loan assets from their customers' deposits. Even though the deposit base presented does not distinguish between core and wholesale deposits, foreign banks in Ghana have maintained good loan financing measure after 2011 which promotes stability of their banks.

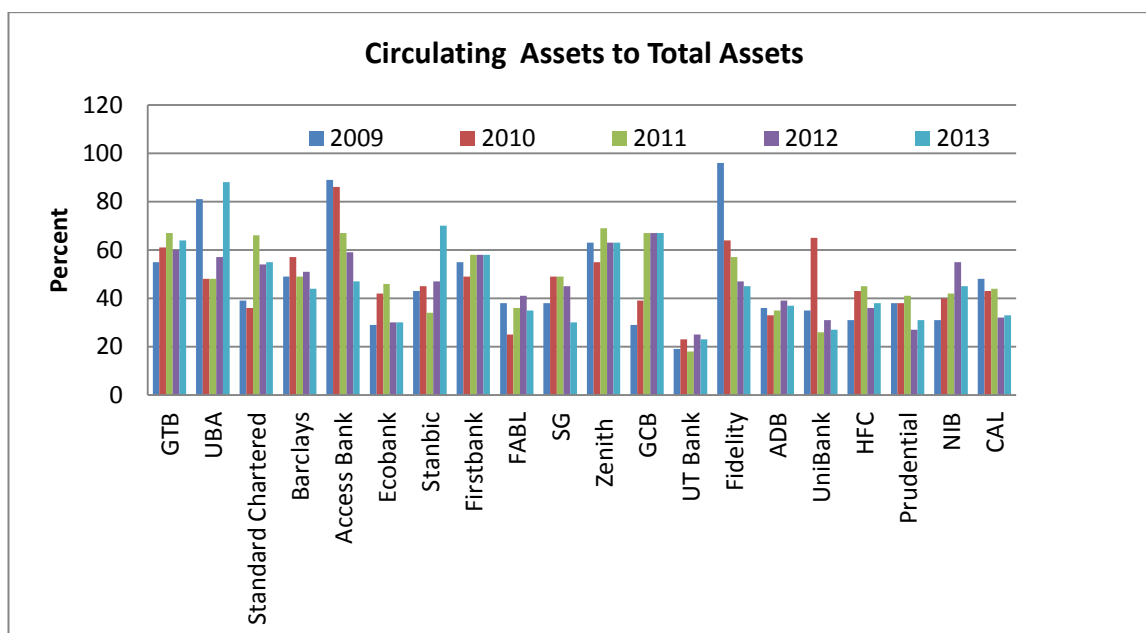
Many of the local banks exhibited similarly, high loan to deposit ratios in the pre-2011 period, notably, GCB, UT, ADB, Unibank and NIB. The post-2011 period shows that pockets of instability and weak liquidity still remain with banks like CAL Bank, HFC Bank and UT Bank. These banks have very high loan to deposit ratios, and typically above 100 %. Such banks are usually using foreign loans and interbank borrowings to fund their loan assets. This exposes the banks to changes in exchange rates and other macroeconomic variables than the other banks. Because they hold loans which are not tradable in the Ghanaian market, that makes them less liquid and vulnerable to the depreciation of the local currency (cedi).

6.3.5.2 Liquidity (LII): Circulating Assets to Total Assets Ratio

The mean value for the circulating assets to total assets ratios of sample banks was 47 %. The minimum and maximum circulating to total assets ratio value reported were 18 % and 98 % respectively for the sample banks in the period of study. Figure 6.8 shows an individual bank's funding of loans from deposits mobilised over the study period from 2009 to 2013.

Figure 6.8

Circulating Assets to Total Asset Ratio (L2) of 20 banks from 2009 -2013



Source : Author's Presentation

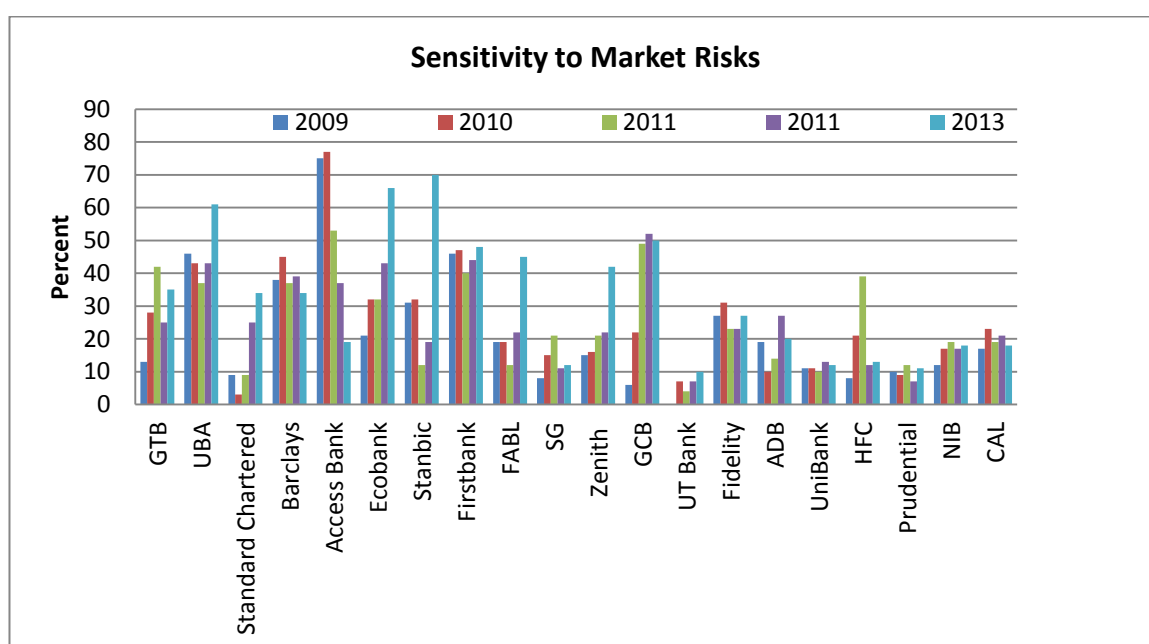
The pattern of distribution for individual banks shows that foreign banks held a relatively higher proportion of their circulating assets to total assets than the local banks. This means that they are able to manage their liquidity positions actively and at minimum costs. Circulating assets tend to have low risks and, therefore, yield low returns. Again circulating assets practically have ready marketability. Supervisors are assured that the banks with high holding of circulating assets in the assets mix, will be able to raise funds rapidly by selling their liquid assets should the need for quick liquidity arise. In terms of stability, banks with high circulating assets to total assets are more solvent than banks that have a low proportion of their assets as circulating asset (Giese et al. 2013).

6.3.6 SENSITIVITY TO MARKET RISKS (SMR)

The mean value for sensitivity to market risks was 47%. The minimum SMR of 0.01% was reported in the period of study. The maximum SMR of 77% was also recorded over the period of study. A minimum of 0.01% and a maximum of 77 % were reported. Figure 6.9 shows the distribution of individual bank's total assets held in the form of marketable investments over the study period from 2009 to 2013.

Figure 6.9

Sensitivity to Market Risk of 20 banks from 2009 to 2013



Source : Author's Presentation

Although there are variations in individual bank's holding of marketable instruments to total assets over the period of study, the impact of holding these instruments and their impact on banking stability needs to be exercised with caution. The foreign banks hold more of these marketable instruments than the

local banks and, therefore, are expected to be more exposed to changes in market rates, which also affect the interest incomes than the local banks. This expected outcome does not hold in Ghana in the period of study because the holding of these assets by the foreign banks is in response to changing economic environment caused by increasing public sector borrowing requirements. Because the government has resorted to borrowing from the domestic market, government bonds and treasury bill rates have been rising and have become more attractive than direct lending to the high-risk dominant SME loan market. A further attraction is that holding of these government bonds and treasury bills, does not attract provisioning, supports high capital adequacy levels and relatively high yields.

6.4.0 UNIVARIATE ANALYSIS: THE CAMELS

This section presents the relationship between the CAMELS variables. The differences in the values reported for the local and the foreign banks are also tested to ascertain the statistical significance of the differences and also to assess how these differences have changed over the period of study.

6.4.1 CORRELATION

The strength of the relationship between the CAMELS variable provides an insight into how bank-level risk taking activities affect each other. Table 6.3 shows the correlation that exists amongst the average CAMELS score and variables.

Table 6.3
Pearson Product Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	AvCAM	CAR	AQ	ROA	ROE	NIM	MGT	LIQ I	LIQ II	SMR
AvCam	1.000									
CAR	0.3184	1.0000								
AQ	0.0043	-0.4042	1.0000							
ROA	0.3384	-0.1325	0.0964	1.0000						
ROE	0.5887	-0.0202	0.2300	0.4088	1.0000					
NIM	0.2786	-0.0000	0.1648	0.3599	0.6990	1.000				
MGT	0.4157	0.1925	0.1400	-0.0765	0.3611	0.1961	1.000			
LIQ 1	0.1851	-0.2538	0.1847	0.3474	0.1007	0.2108	0.1791	1.000		
LIQ 2	0.4486	0.3365	-0.2448	0.1337	0.2072	0.0941	0.5370	0.2562	1	
SMR	0.3266	-0.1721	0.0000	-0.1710	-0.1042	-0.2934	-0.2485	-0.3277	-0.4344	1.000
Software Used : STATA 12.0										

Column 1 of Table 6.3 shows the Pearson product-moment correlation matrix and suggests that the average stability measure (AvCAM) relates positively with variables notably CAR, ROA, ROE, LIQ 1, LIQ 2, NIM and SRM. It is less affected by the AQ. Column 2 shows that LIQ 2 and MGT are positively related to the capital adequacy (CAR) positions of banks. Improvements in these variables are likely to improve the capital adequacy position of banks.

Likewise, LIQ 1, ROE, ROA, AQ and SRM relate negatively with CAR and therefore improvements in their quality will enhance the capital adequacy ratios of banks. Column 3 of Table 6.3 shows that asset quality relates positively with all the variables except for LQ2 indicating the trade-off between liquidity and non-performing loans. Increases in non-performing assets reduce liquidity. Likewise, the NPLs levels affect capital, return on investments, return on equity and the liquidity position of banks. Column 4 shows that when the management

of a bank is able to control the cost of operations, it will also improve the other indicators. In other words, it suggests that cost control has a direct impact on ROA through the direct relationship between bank operating costs and operating profits. Column 10 of Table 6.3 suggests that banks sensitivity to market risks is negatively correlated with the rest of the variables except asset quality. Overall, the highest correlation is found to exist between NIM and ROE at 69% in column 5.

Table 6.4
Spearman Rank Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	AvCAM	CAR	AQ	ROA	ROE	NIM	MGT	LIQ I	LIQ II	SMR
AvCam	1.0000									
CAR	0.3112	1.0000								
AQ	0.0000	-0.4042	1.0000							
ROA	0.3391	-0.1325	0.0964	1.0000						
ROE	0.4654	-0.0104	0.2024	0.3316	1.0000					
NIM	0.3484	0.0645	0.1760	0.5125	0.6055	1.000				
MGT	0.4202	0.1925	0.1400	-0.0765	0.3765	0.3025	1.000			
LIQ 1	0.2455	-0.2867	0.2086	0.4556	0.2523	0.4454	0.2483	1.000		
LIQ 2	0.4220	0.3311	-0.2492	0.1361	0.2242	0.2064	0.5273	0.2344	1.000	
SMR	0.2345	-0.1211	-0.0934	-0.1968	-0.1606	-0.3593	-0.2859	-0.4259	-0.4806	1.000
Software Used : STATA 12.0										

Column 1 of Table 6.4 shows the Spearman rank correlation matrix, which does not assume linearity and suggests that the average stability measure (AvCAM) relates positively with variables notably CAR, ROA, ROE, LIQ 1, LIQ 2, NIM and SRM. It is less affected by the AQ. Column 2 shows that, LIQ 2, MGT and NIM are positively related to the capital adequacy positions of banks. In the

Spearman rank correlation, NIM is positively related to CAR which suggests that improvement in interest margins through lower cost of funds will improve profits and reserves, which will positively impact on the CAR. Again, Column 10 of Table 6.4 and the supporting row for SMR, suggest that banks sensitivity to market risks is negatively correlated with the rest of the variables. Overall, the highest correlation is found to exist between NIM and ROE at 60% in Column 5. Although, the Pearson correlation coefficient for the relationship between SMR and AQ is positive, the non-parametric Spearman correlation is negative. The reverse is the case for NIM and CA.

Overall, the Pearson correlation coefficients and the Spearman rank correlation coefficients suggest similar patterns or direction, and strength of the relationships among the CAMELS variables except that the relationships tend to be relatively stronger under the Pearson product-moment correlation matrix.

The rule of thumb for checking problem of multicollinearity is when the correlation is greater than 0.7 (Tabachnick and Fidell 1996). Again, a sample correlation of more than 0.8 is evidence of severe collinearity (Gujirati and Porter 2009). The results suggest that multicollinearity might not be a problem because the correlations are less than 0.8 (Gujirati and Porter 2009).

6.4.2 SAMPLE T-TEST OF CAMELS VARIABLES

An obvious question that arises from the charts above is whether or not the differences observed across the foreign banks and the local banks are statistically significant. The t-test for differences in means is used to test for any significant differences in the various ratios between the group of foreign banks

and the local banks. The t-procedures, hinge critically on the assumption of normality and the law of large numbers, in addition to having independent samples. The result is presented in Table 6.5.

Table 6.5

T-tests of Differences in Means of the CAMELS Variables: 2009-2013

T-tests					
	(1)	(2)	(3)	(4)	(5)
CAMELS Variable	Foreign	Local	Difference	t-value	p-value
CAR	25.19	15.26	9.93	2.9111	0.0093
NPL	11.96	12.92	-0.96	0.2487	0.8064
MGT	54.08	65.44	-11.36	2.9588	0.0084
ROA	3.11	1.92	1.19	2.4474	0.0249
ROE	19.27	15.27	4.00	1.0123	0.3248
NIM	9.32	9.09	0.23	0.2575	0.7997
LIQ1	60.58	82.13	-21.55	3.8349	0.0012
LIQ 2	52.18	40.68	11.50	2.2039	0.0408
Mkt. Sen.	32.54	17.95	14.59	2.8851	0.0099
Overall Score	10.6	9.9	0.70	2.3792	0.0286
Software Used: STATA 12					

The independent samples t-test is used to examine the differences in CAMELS variables for both foreign and local banks from 2009 to 2013 using the average

of the variables. Column 3 of Table 6.5 shows the differences in the means of average CAMELS variables of foreign and local banks. Of statistical significance are the p-values reported for the differences in the means of the capital adequacy levels, the efficiency of operations measured by the cost income ratio or management(MGT), loans to deposit ratio or liquidity 1 (LQ 1) and sensitivity to market risks(SMR). They are statistically significant at the 1%, 5% and 10% levels.

The LIQ(1) figures show that the local banks channel a greater proportion(82%) of their deposits into loans as compared to the average loan deposit ratio of their foreign peers(60%). Loans are not easily saleable in Ghana and that partly explains why the local banks appear to hold less liquid assets or circulating assets than the foreign banks (LIQ 2). The differences in means of their LQ(2) and return on assets(ROA) are statistically significant at the 5% and 10% levels. However, the local banks performed better than the foreign banks as they are less exposed to market risk (SMR) theoretically.

The parametric t-test shows that the foreign banks are more liquid, more efficient in terms of lower cost to income ratios and have a higher risk capital level on average. And using the average composite CAMELS measure, the foreign banks show a higher level of stability than the local banks and it is significant at the 5% and 10% levels. The t-test shows that the differences in non-performing loans (NPL), net interest margin (NIM) and return on equity (ROE) are not statistically significant at the 1%, 5% and 10% levels.

The non-significance of the difference in mean is plausible. This can be explained by the pursuit of competitive pricing of personal, business and

institutional loans and the concentration of assets in government securities, which provide relatively similar margins on activities. Given the size of the Ghanaian banks and the existing regulation of bank lending, banks tend to share many of the high value and emerging business opportunities, like cocoa, oil and energy related financing, with other players through loan syndication. This changing market situation is also a contributory factor to the non-significance of their levels of non-performing loans, net interest margin and return on equity differences.

6.5.0 THE Z–SCORE MEASURE

This section presents the Z-score measure as a proxy for bank stability in Ghana from 2009 to 2013. Table 6.5 shows the list of sample banks in Ghana and their Z-scores over the period. The first eleven on the list are foreign banks and the rest, i.e. from number 12 on the list are local banks.

6.6.0 COMPARATIVE DESCRIPTIVE STATISTICS OF Z-SCORE

Table 6.6 illustrates the Z-score and its decomposed components of leverage and portfolio risks of sample banks in Ghana. The distinction is important as it shows that where leverage risk is low for a bank, the portfolio risk is available to improve the level of stability measure or the Z-score.

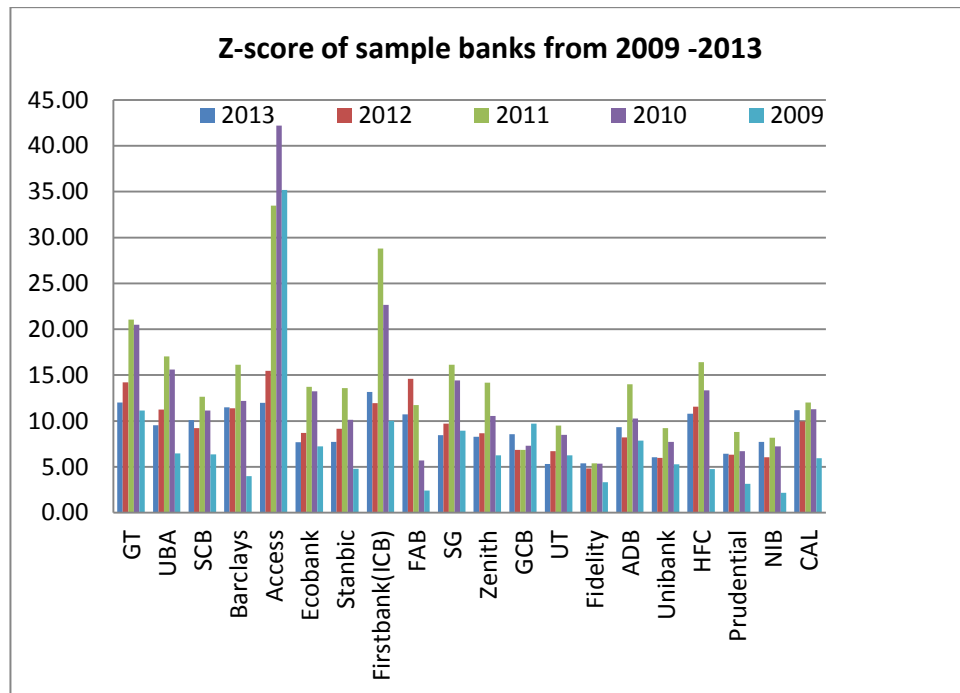
Figure 6.10 and Table 6.6 below show that after 2011, both the average Z-scores of the banking industry and some individual bank's Z-scores have declined.

The stability levels achieved by the sampled Ghanaian banks become more meaningful when they are compared with their peers in South Africa and Nigeria using their average stability scores as shown in Figure 6.11.

Table 6.6
Summary Z –Scores of 20 Sample Banks from 2009-2013

N0.	Bank	2013	2012	2011	2010	2009	Average	Leverage Risk	Portfolio Risk
1	GT	12.01	14.22	21.05	20.51	11.15	15.79	13.18	2.60
2	UBA	9.54	11.23	17.05	15.61	6.45	11.98	9.46	2.52
3	SCB	10.10	9.21	12.65	11.13	6.38	9.89	6.90	2.99
4	Barclays	11.48	11.39	16.14	12.18	4.00	11.04	8.77	2.27
5	Access	11.96	15.47	33.47	42.18	35.20	27.66	25.06	2.59
6	Ecobank	7.70	8.70	13.71	13.22	7.25	10.12	7.66	2.46
7	Stanbic	7.71	9.15	13.58	10.11	4.80	9.07	7.50	1.57
8	Firstbank	13.17	11.94	28.78	22.66	10.04	17.42	16.39	0.93
9	FABL	10.74	14.60	11.75	5.70	2.41	9.04	8.18	0.86
10	SG	8.46	9.71	16.15	14.43	8.95	11.54	9.76	1.78
11	Zenith	8.28	8.66	14.17	10.54	6.26	9.58	7.76	1.82
12	GCB	8.55	6.87	6.85	7.31	9.71	7.86	6.07	1.79
13	UT	5.33	6.70	9.51	8.48	6.25	7.25	5.95	1.31
14	Fidelity	5.37	4.83	5.38	5.35	3.33	4.85	4.01	0.84
15	ADB	9.33	8.22	14.00	10.27	7.88	9.94	8.23	1.71
16	Unibank	6.04	5.97	9.21	7.72	5.28	6.85	5.77	1.07
17	HFC	10.81	11.55	16.43	13.35	4.74	11.37	9.76	1.61
18	Prudential	6.45	6.34	8.81	6.72	3.16	6.30	5.43	0.87
19	NIB	7.72	6.07	8.18	7.24	2.17	6.28	5.94	0.33
20	CAL	11.18	9.96	12.01	11.27	5.95	10.07	8.10	1.97
	Average	9.10	9.54	14.44	12.80	7.50	10.69	9.01	1.68
	Source: Computed by Author								

Figure 6.10
Z-score of 20 Sample banks 2009 to 2013



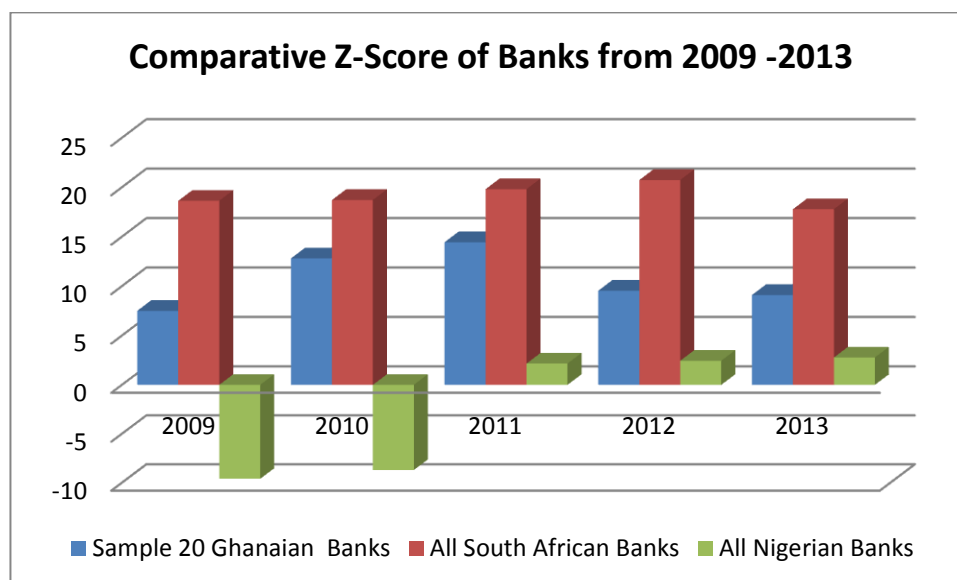
Source: Author's Presentation

Comparatively, the Nigerian banking sector stability figures are very low ranging from -9.6 in 2009 to 2.78 in 2013. Although Ghana and South Africa had their banking stability levels reduced in 2013 from their 2012 levels, the stability scores of the Nigerian banking sector contrasts sharply with stability scores reported for the Ghanaian and South African banks.

Comparative analysis of the stability score of the 20 Ghanaian banks with that of South African and Nigerian banks in their home countries show that the South African banks have consistently achieved a higher stability score on average than the sampled Ghanaian banks over the period of study. All things being equal, with a higher stability score on average and also from a high rigour regulatory regime, the South African banks therefore pose less threat to the

stability of Ghana's banking system, but the regulator still needs to ensure that their activities are effectively monitored.

Figure 6.11: Comparative average Z-Scores of Ghanaian and Foreign Banks Home Country Banking Stability Levels



Source: World Bank and Federal Reserve Bank of St. Louis(2016).

Overall, the picture from Figure 6.11 reinforces the IMF-FSB-BIS (2016) micro and macro-prudential arguments that consolidated balance sheet of regulated banks, sanitised licensing regime, and enforcement of cross-border regulation are very crucial for monitoring of banks. Furthermore, these findings suggest and support the view that a proactive and an intrusive approach to regulation (FDIC 2013) should continuously be applied in jurisdictions that open up their banking sector like Ghana (Enoch et al. 2015).

6.7.0 GRANULAR ANALYSIS OF Z-SCORES OF SAMPLE 20 GHANAIAN BANKS

Table 6.7 shows that the year 2009 had the least solvency level of 2.41 while 2010 produced the highest Z–score of 42.18. Bank stability scores in the year 2013 show the least of the maximum Z-scores. Again the year 2013 produces the least difference between the minimum Z-score of 5.33 and the maximum Z –score of 13.17. Overall the stability score improved from 7.57 in 2009 to 14.44 in 2011 and has since been declining. It declined by 33.93% from 14.44 in 2011 to 9.54 in 2012 and declined further by 4.7% from the 2012 level to 9.09 in 2013 as also shown in Figure 6.11.

Table 6.7

Summary Descriptive Statistics of Z- scores

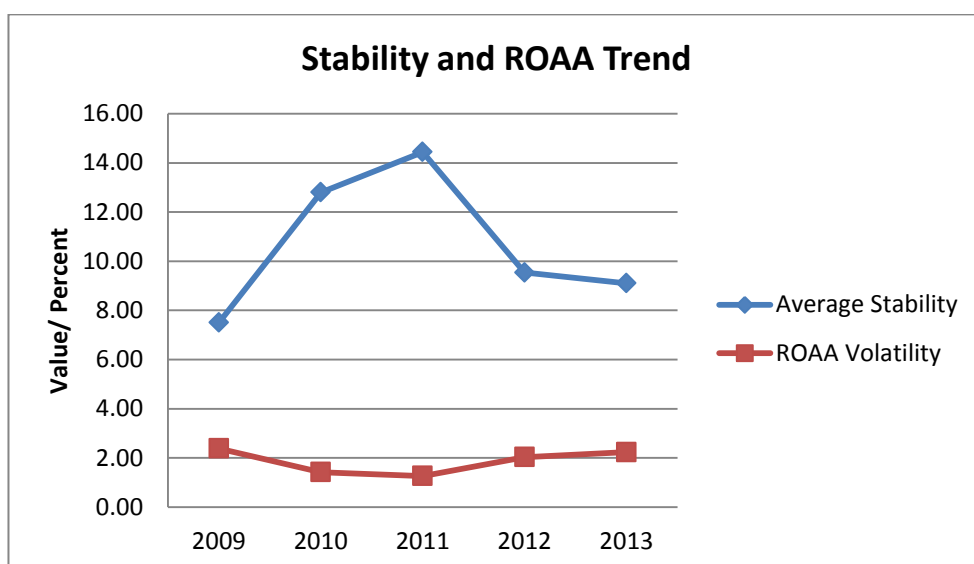
Variable	Obs	Mean	Std. Dev.	Min	Max
2013	20	9.097	2.314	5.33	13.17
2012	20	9.540	3.034	4.83	15.47
2011	20	14.44	11.178	5.38	33.47
2010	20	12.80	8.231	5.35	42.18
2009	20	7.57	7.037	2.41	35.20
Z-score Average	20	10.69	5.506	4.66	26.96
Leverage Risk	20	9.01	5.264	4.01	25.06
Portfolio Risk	20	1.68	0.732	0.33	2.99
Software Used: STATA 12					

This trend can partly be explained by the fact that volatility of earnings on average assets declined from 2.38 in 2009 to 1.26 in 2011 and reversed by increasing from the 2011 level by 61% to 2.03 and subsequently to 2.23 in 2013 below the 2009 level of volatility. The volatility of ROAA trend is presented in Figure 6.12 below.

Further analysis shows that out of the 20 banks sampled, 13 or 65 % had an average stability score below the average Z-score of 10.69 from 2009- 2013. Among the 13 banks identified as having below the average stability threshold figure, eight were state-owned and private local banks. Only one local bank had stability score above the average. Five of the foreign and regional banks had their stability score below average. Six had their scores above the overall average.

Figure 6.12

Volatility in ROAA and Bank stability trend



Source: Author's Presentation

The stability score is further decomposed into portfolio and leverage risks to identify the main drivers of banking stability (Khöler 2015). In addition, 55% of the sampled banks totalling 11 have portfolio risks that are fairly above the average of 1.693. However out of this total of 11banks, 8 are foreign banks and the 3 are local banks. With the remaining sample, 3 out of the 9 are foreign banks and the rest being local banks had their portfolio risks scores falling

below the average portfolio risks score. Tables 6.6 and 6.7 also show that the stability scores of banks are largely from their leverage risks figures. This reflects the low diversity of products and services on the Ghanaian market.

6.8.0 UNIVARIATE ANALYSIS: THE Z-SCORE

This section examines the correlation between the Z-score and the individual variables that affect the bank stability values which include bank size, interbank borrowing and debts, non-performing loans, regulatory governance, risk governance, origin and its own decomposed elements of portfolio and leverage risks. From the OLS diagnostic tests shown in Appendix 5.4, the data is found to be normal and therefore the Pearson product-moment correlation matrix is used to ascertain if there is a possibility of multicollinearity.

6.8.1 CORRELATION: Z-SCORE AND REGULATION AND BANK-LEVEL VARIABLES

The Table 6.8 below shows the correlation that exists amongst model variables.

Table 6.8 Pearson Product-Moment Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Z-score	Size	Interborr	NPL	RiskGov	RegInd	Origin	Levrisk	Portrisk
Z-score	1.0000								
Size	-0.1718	1.0000							
Interborr	-0.0418	-0.0478	1.0000						
NPL	-0.0531	-0.0093	0.0299	1.0000					
Riskgov	0.1782	0.3776	0.1169	-0.1193	1.0000				
RegInd	0.1754	-0.0261	-0.1232	-0.1429	0.2113	1.0000			
Origin	0.4689	0.0564	0.0561	-0.0179	0.3054	0.6804	1.0000		
Levrisk	0.9517	-0.2991	-0.0627	0.0561	0.0754	0.1327	0.4343	1.0000	
Portrisk	0.2023	0.4131	0.0817	-0.2401	0.3510	0.1341	0.1648	-0.0003	1.0000
Software Used: STATA 12									

The simple correlation matrix in Table 6.8 shows six measures of regulation and bank –level risk activities and the Z-score. The correlations in column 1 of Table

6.8 suggest that the Z-score is negatively correlated with size, interbank borrowing and non-performing loans. The column 6 of Table 6.8 for example, shows a positive correlation of 0.68 between origin and regulatory independence. The correlations reported in column 1 range between -0.17 to 0.46 indicating that various measures captured relate differently with the Z-score. Leverage risk has a correlation of 0.95 indicating that the stability score depends largely on the size of the leverage risks of banks. This will pose no multicollinearity problem because leverage risk is not used as a regressor in this research. Correlations reported in columns 2 to 7 of Table 6.8 also range between -0.29 to 0.68. The findings suggest that the bank-level variables also correlate differently with the regulatory variables.

The results suggest that multicollinearity might not be a problem because the correlations are less than 0.8 (Gujirati and Porter 2009). Again, Table 6.8 only showed the association between the Z-score and the bank-level and regulatory variables which might be suggestive. Unless causality is established as will be discussed in chapter 7, such results are rarely compelling (Wooldridge 2013).

6.8.2 SAMPLE T-TESTS OF THE Z-SCORES

Again an obvious question that arises from Tables 6.6 and 6.7 above is whether or not the differences shown are statistically significant. The independent samples t-test is used to examine the differences in Z-score variables for both foreign and local banks from 2009 to 2013 using the average of the variables.

The results in columns 1 through 3 of Table 6.9 suggest that foreign banks are more stable than local banks. Except for the year 2009, column 5 of Table 6.9,

which reports the p-values, suggests that the stability gaps which exist between the foreign and local banks from 2010 to 2013 are statistically significant.

Table 6.9
T-tests of Differences in Means of the Z-Scores of 20 banks
from 2009 -2013

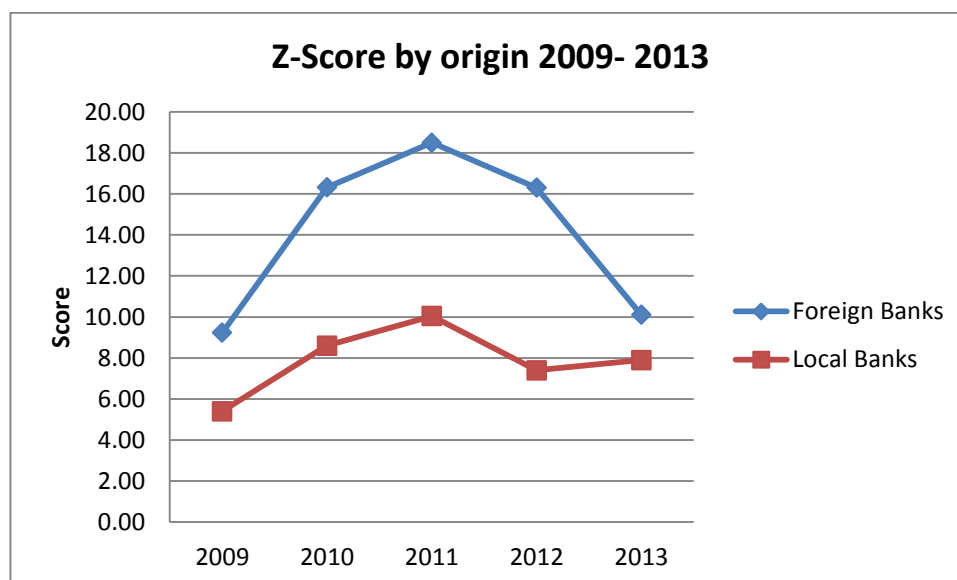
T-test					
	(1)	(2)	(3)	(4)	(5)
Year	Foreign	Local	Difference	t-value	p-value
2009	9.35	5.38	3.97	1.287	0.2143
2010	16.32	8.63	7.69	2.238	0.0381
2011	18.05	10.04	8.01	3.107	0.0061
2012	11.29	7.39	3.90	3.703	0.0016
2013	10.10	7.86	2.24	2.411	0.0268
2009- 2013	13.49	7.86	5.63	2.609	0.0178
Software Used: STATA 12					

In 2010, the reported difference was statistically significant at the 5% and 10% levels. In 2011 and 2012 the differences are statistically significant at the 1%, 5% and 10%. In 2013, the difference in stability was statistically significant at the 5% and 10% levels. The overall average difference in stability from 2009 to 2013 was statistically significant at the 5% and 10% levels. Column 4 of Table 6.9 is supported by Figure 6.13 below, which shows that trend in stability

differences is an inverse U-shaped, with the stability gap increasing between the two groups from 2009 to 2011 and falls between 2012 and 2013.

Figure 6.13

Z-score by origin of 20 banks from 2009-2013



Source: Author's Presentation

Figure 6.13 also presents the average comparative stability levels using the Z-score of foreign and local banks. The results show that stability levels are higher in foreign banks than local banks but both experienced decline in their measured stability levels in 2012 and 2013. However, the average differences between stability score have been reducing since 2011. The narrowing gap between foreign and local banks stability can be explained from the capitalisation regulation and improved efficiency of local banks despite the increased volatility in their ROAAs as shown in Figure 6.12.

6.9.0 COMPARATIVE MICRO ANALYSIS OF STABILITY RATING OF SAMPLE BANKS USING CAMELS AND Z-SCORE AS MEASURES IN GHANA

This section discusses the issue of whether the two measures of stability provide similar or different quality of information on the level of banking sector stability. Banks are therefore individually ranked from 2009 to 2013 using the two measures. The findings are presented in Tables 6.10 through to 6.13. Again the findings provide the opportunity to analyse further the micro-dimensions of the stability trends and their possible implications.

6.9.1 COMPOSITE RATING OF SAMPLE BANKS USING CAMELS

Individual CAMELS variables were combined to establish a composite score that determines the overall stability of each bank. Table 6.10 reports the stability levels of sample bank using the composite CAMELS rating in the period of study.

Table 6.10

Summary CAMEL Composite Rating of 20 banks from 2009 -2013

CAMELS rating of sample banks					
Rating	2009	2010	2011	2012	2013
1 or Strong	7	8	8	11	12
2 or Satisfactory	11	12	11	9	8
3 or Fair	2	0	1		
4 or Marginal					
5 or Unsatisfactory					
Total	20	20	20	20	20
Source: Computed by Author					

Table 6.10 shows that the average level of bank stability has improved since 2009 where two banks were classified as 'fair'. In 2010, all the banks in the sample were categorised as either 'strong' or 'satisfactory'. The situation reversed slightly in 2011 with a bank being classified as 'fair', the number of sample banks classified as strong improved from 7 in 2009 to 8 in 2010 and 2011. In 2012, following the completion of the recapitalisation regulation, the number of banks classified as strong increased from 8 to 11, approximately 30% change. At the same time, the number of banks classified as satisfactory fell from 11 to 9, approximating a drop of 18%. The improvement continued in 2013, with the number of banks classified as strong increasing to 12 while those in the satisfactory category reduce by one or 11%.

In short, there were more banks classified as satisfactory banks in 2009, than strong banks. The situation reversed by the end of 2012. In 2013, four additional banks migrated to become strong banks increasing the strong category by 50% over the 2011 figure.

The CAMELS rating by origin using the annual CAMELS ratings from 2009 to 2013 is presented in Table 6.11 below. The summary table shows that the foreign banks are relatively stronger than the local banks. Columns 1 through to 3 of Table 6.11 suggest that the stability of the local banks improved marginally from two banks being classified as fairly stable to satisfactory after their recapitalisation in 2010.

Similarly, foreign banks classified as strong increased from 6 to 7 by 2011 partly due to Barclays' complete exit from the micro-financing business and full write-off of the losses in 2009. In 2012 and 2013, the number of foreign banks

classified as strong increased to 8, as Access Bank strengthened its balance sheet through the acquisition of the Intercontinental Bank operations in Ghana, and restructuring its loan portfolio.

Table 6.11

CAMELS rating and classification of 20 sample banks

CAMELS Classification	Year									
	(1)		(2)		(3)		(4)		(5)	
	2009		2010		2011		2012		2013	
	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign
1 or Strong	1	6	2	6	1	7	3	8	4	8
2 or Satisfactory	6	5	7	5	7	4	6	3	5	3
3 or Fair	2	0	0	0	1	0	0	0	0	0
4 or Marginal	0	0	0	0	0	0	0	0	0	0
5 or Unstable	0	0	0	0	0	0	0	0	0	0
Total	9	11	9	11	9	11	9	11	9	11
Source: Computed by Author										

Even though Stanbic Bank moved from being strong to satisfactory in 2013, its place was taken by the First Atlantic Bank (FABL), which has been restructured by its new foreign owners, with new capital injections in 2012.

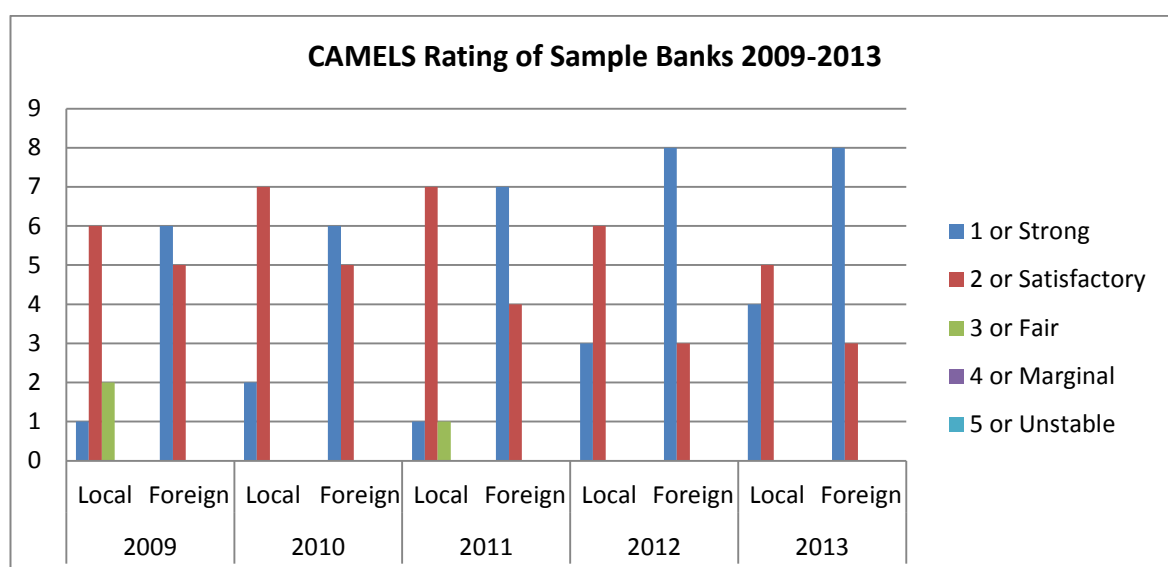
Similarly, in 2012 and 2013, the number of local banks classified as strong increase from 1 in 2011 to 3 in 2012. In 2013 the number improved further to 4 while those classified as satisfactory decreased from 7 in 2011 to 5 in 2013.

The overall picture points to an improved, growing and relatively stable banking system according to the CAMELS rating as shown below in Figure 6.14

because the sample banks could be classified either as strong or satisfactorily strong.

Figure 6.14

CAMELS Rating of 20 Sample Banks 2009-2013



Source: Author's Presentation

6.9.2 COMPOSITE RATING OF SAMPLE BANKS USING THE Z-SCORE

Table 6.12 presents the summary stability trends of the sample banks using the Z-score. Between 2009 and 2011, the number banks classified as highly stable based on the Z-score increased from 3 to 14, but declined from the 2011 level by more than half by 2013 as shown in columns 1 through to 3 of Table 6.12. Columns 2 through to 5 suggest that the number of banks in the stable category has more than tripled from 2 in 2009 to 7 in 2012 and reduced to 5 in 2013. Contrast to that, the number of banks classified as fairly stable reduced from 6 in 2009 to 1 in 2011 and reversed by increasing to 4 in 2012 and 5 in 2013.

Table 6.12
Summary Composite Z-score rating of 20 Ghanaian Banks

	(1)	(2)	(3)	(4)	(5)
Year	2009	2010	2011	2012	2013
1 or Highly Stable	3	13	14	7	8
2 or Stable	2	1	4	7	5
3 or Fairly Stable	6	4	1	4	5
4 or Significantly Unstable	5	2	1	2	2
5 or Absolutely Unstable	4				
Total	20	20	20	20	20
Source: Computed by Author					

From Table 6.12, almost half of the banks sampled, would be classified as either significantly unstable (25%) or absolutely unstable (20%) in 2009. By 2013, no bank was classified as absolutely unstable but 2 local banks (10%) were classified as significantly unstable. These findings are in contrast to the classifications based on the CAMELS presented in Table 6.10. The banks appear relatively stronger based on the CAMELS classifications.

Table 6.12 is further decomposed into local and foreign banks to examine the micro dynamics with respect to individual banks in each group. The decomposed stability levels of sampled foreign and local banks are presented in Table 6.13 and Figure 6.15 below. Table 6.13 reports the trends in the stability profile of foreign and local banks from 2009 to 2013 incorporating the effect of capital regulation introduced between 2009 and 2012. After meeting the capital regulation in 2011, all foreign banks were classified as class 1 or highly stable banks. Five out of the number have fallen into either the stable or fairly stable

category by 2013. On the other hand, local banks have maintained their level of classification in the highest category, slightly reduced their presence in the stable category by 2012. However the number of local banks classified as either fairly stable or significantly unstable in 2011, have by 2013 more than doubled from 2 to 5. No local bank is classified as absolutely unstable by 2013. A comparative analysis of 2009 and 2013 stability levels using the Z-score indicates that stability levels of the banks both local and foreign have improved. This is largely consistent with the findings of the CAMELS. However the essence of ascertaining banks stability is brought fully to light if a comparison is done between 2009 and 2011; first being the compliance and transition period and subsequent comparison between 2011 and 2013.

Z-score analysis removes the camouflage from the banks stability levels by showing that the stability of banks has been declining since 2012 through to 2013 and that the relative proportion of the total assets of banks that can be funded using their capital has decreased significantly. Furthermore, the rate of deterioration is occurring faster in the foreign banks than in the local banks. This is because while the local banks have their capital naturally hedged, because they were initially in the local currency, their foreign counterparts had their capital initially provided in US dollars. The depreciation of the local currency over time can lead to impairment of the dollar-denominated capital.

Another reason is the quality of operational transparency and disclosures (Ratnovski 2014), and the degree of regulatory rigour from the parent jurisdiction, notably the UK, Indian and South African banks that enforce the IFRS requirements on dynamic provisioning and write-off policies partly explain

why foreign NPLs are equally high and express in the rapid deterioration of their stability levels.

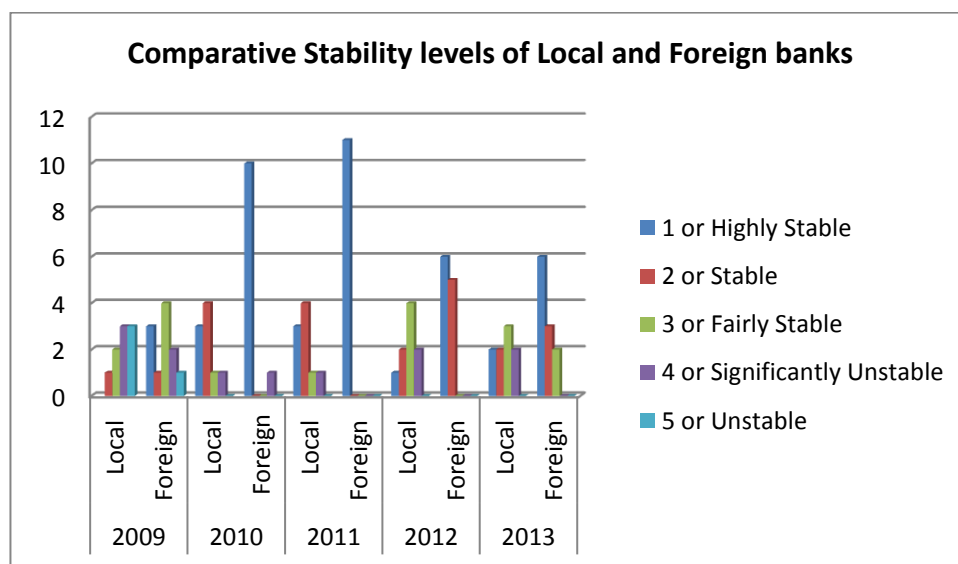
Table 6.13

Decomposed Z-score classification of sample 20 banks

Z-Score Classification of Banks	Year									
	(1)		(2)		(3)		(4)		(5)	
	2009		2010		2011		2012		2013	
	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign
1 or Highly Stable	0	3	3	10	3	11	1	6	2	6
2 or Stable	1	1	1		4	0	2	5	2	3
3 or Fairly Stable	2	4	4	0	1	0	4	0	3	2
4 or Significantly Unstable	3	2	1	1	1	0	2	0	2	0
5 or Unstable	3	1	0	0	0	0	0	0	0	0
Total	9	11	9	11	9	11	9	11	9	11
Source: Computed by Author using Tables 5.3 and 6.6										

Figure 6.15

Comparative Z-score classification 20 banks by Origin



Source: Author's Presentation

6.10.0 REGULATORY AND POLICY IMPLICATIONS OF FINDINGS

The fundamental conclusion deduced from Table 6.13 which used the Z-score index to assess the level of stability of banks in Ghana, is that 10% of the banks could be classified as weak in 2011. The number increased to 30% in 2012 and finally to 35% or 7 banks in 2013. This insight into the level of stability of banks in Ghana differs from the insight that could be drawn from Table 6.11 which classified their stability status using the composite CAMELS.

These findings suggest three specific implications for banking regulation and banking policy in Ghana. The first suggestion revolves around the need to investigate into the actual quality and structure of banking sector assets which demands improved accounting, transparency and disclosure of banking activities. The second requires the regulator to take steps to minimise 'profit mining' tendencies. The third challenges the regulator to create the needed structures to protect small savers in Ghana. These implications are critically reviewed below.

6.10.1 IMPROVING ACCOUNTING, TRANSPARENCY AND DISCLOSURE OF BANKS LOAN ASSET QUALITY

To promote accounting, transparency and disclosure of banks loan asset quality, banks should be required to show how they have valued the collateral backing any secured loan and the rigour of the cash flow analysis that supports such an exposure. This is particularly necessary in developing countries like Ghana where unsecured loans and excesses have served to promote entrepreneurship and development of the SME segment. On the other hand,

excesses have been one of the main sources of bad loans in Ghanaian banking practice (BOG 2014). This will improve the quality and completeness of information available for regulatory monitoring, as well as the policy objective of ensuring banking sector stability and investor interest (Barth et al. 2013). Specifically, the provisioning for impairment needs to be dynamic and write-off policies need to be stringent to compel all players, notably the government to be more responsive to settling state agencies indebtedness to banks (BOG 2014).

An additional benefit of having proper accounting and reporting system for impairment of loans of supervised banks is to improve their credit ratings by their correspondent banks. Indiscriminate rating of Ghanaian banks affect negatively the interest rates placed on their borrowings offshore which also contribute to the volatility in their return on assets if these increased costs cannot be passed through to customers in delivering their services.

6.10.2 MINIMISE THE INCENTIVES TO PROFIT MINE BY BANKS

Profit mining observed in Ghanaian banking sector, is a practical way of using the entrenchment view in corporate governance theory (Saghi- Zedek and Tarazi 2015), in a positive way and not in the negative way. This does not involve insider expropriation (Boubakri and Ghouma 2010) but it is an aspect of tunnelling of initial capital by the investor in a jurisdiction where the currency value continue to fall against the convertible currencies which was initially used to secure the banking license with the aim of shelving the capital to be recycled to satisfy the nominal capital requirements in future and also ensure that average return on investments globally are protected in the group's performance setting(Blankenburg and Khan 2012).

This is very successful where the banking regulator does not require and /or enforce the need for consolidated balance sheet reporting of the licensed conglomerate banks whether local or foreign. The shelving of capital is carried through high management fees, IT infrastructure costs and support, training, intra-group lending and placements at managed rates. The banking license then becomes like an oil field or a mining concession where the investor has fully recovered his initial investments and continue to exploit the reserves for a continued and guaranteed positive return over the concession period (Duval et al. 2009).

In the case of banking, it is carried out at the expense of depositors in Ghana. For example an investor in 2009 who acquired a banking license with the minimum capital requirement of GH¢60 million required \$60 million then, now needs \$32 million to satisfy the current minimum requirements of GH¢120million in 2015(BOG, 2014). While globally, regulators are increasing the capital requirements in nominal and in real terms (Noonan and Binham 2015), the Ghanaian regulator is rather reducing the dollar benchmarked minimum capital requirements.

Secondly, pursuing nominal capital regulation over very short periods also poses serious disincentives to shareholders and potential investors in the banking sector. The combined high business environmental risk and the growing regulatory challenges as discussed in chapter 2 are, in effect, encouraging both local and foreign banks to develop techniques of capital shelving as part of their capital management strategy to satisfy such frequent

nominal capital increases by the regulator, a feature that is quite frequent and unique to Ghana.

One option is for the regulator to consider the dollarization of the minimum capital especially in an import-driven economy like Ghana to promote stability in the capital reported by banks but it comes with the risk that once the local currency strengthens against the dollar, it reduces the required capital and increases management discretion. Alternatively, and preferably, the regulator should consider measures that will always encourage investors to commit their capital to the domestic economy by simply implementing the raw leverage ratio suggested by Basel III and adapting into its monitoring scale the Z-score rating used in this research which follows the FIDC(2013) developed scale.

This approach will be in sync with the empirical literature (Grill et al. 2015) because banks will have to optimise their return on their capital, and their deposit insurance rating simultaneously by choosing their transactions carefully. This will potentially and to some extent minimise the inherent moral hazard partly induced by 'profit mining' which tend to reinforce themselves.

6.10.3 PROTECTION OF SMALL SAVERS AND DEPOSITORS

If owners of banks are incentivised to profit mine and shelve their capital, coupled with their limited liability status and there is absence of cross-border regulation and consolidated accounting by these foreign banks, it becomes imperative to design an effective mechanism to protect the depositors in Ghana. These issues are further explored and discussed in Chapters 7 of the study.

If the Z-score is signalling a deteriorating trend in the stability of banks in Ghana from Table 6.13, then, the next chapter will extend the discussion by examining the hypotheses concerning the relationship between the regulatory structures and bank-level risk management practices and bank stability over the research study period from 2009 to 2013.

CHAPTER 7

MULTIVARIATE AND PANEL DATA ANALYSIS

7.1 INTRODUCTION

This chapter first reports the dependence of the Z-score on the regulatory and bank-level risk variables in Ghana using the pooled OLS, the fixed effects and panel random effects regression models discussed in chapter 5. The chapter seeks to achieve three main objectives. First, it empirically tests the hypotheses in chapter 4 to ascertain if the identified regulatory and bank –level variables significantly affect the bank stability in Ghana or not as discussed in the empirical literature. Secondly, it summarises the research findings in this chapter. Third, it tries to present the implications and recommendations of the research findings.

7.2 EMPIRICAL FINDINGS: PANEL DATA REGRESSION ANALYSIS

This section presents the initial panel data regression results for the full sample banks. In order to test the hypotheses, we used several estimation methods. First, we applied pooled ordinary least squares (OLS), assuming that a common error structure applies to all banks. Yet, treating banks as homogeneous entities is most likely too strong a restriction. Furthermore, there is the need to reduce the potential that pooled OLS outcomes will be biased or inaccurate if time-invariant individual effects are observed. Another option would have been to estimate the bank specific effects as fixed parameters.

The purpose for including the fixed effects model in this analysis is that, it will remove any biased or unreliable pooled OLS estimator that can be attributed to

time-invariant individual effects from the error term and the autocorrelation of the error term (Verbeek 2008). However, this would imply that many degrees of freedom would be lost since our panel contains many banks relative to years. We therefore in principle assume that all (unobservable) factors that influence individual bank behaviour, but that are not captured by our regressors, can be summarised by a random error term.

Primarily, the random effects model will account for the potential that individual effects vary over time (Park 2011). Also, we are not so much interested in the value of the unobserved bank-specific effect, but rather in making inferences with respect to population characteristics. Therefore, the random effects (RE) model is estimated. We tested our final specification whether the pooled OLS, fixed effects (FE) or RE was to be preferred using both the Hausman specification test and the Breusch-Pagan Lagrangian multiplier (LM) test. The estimates pooled, fixed and random effects regression results based on the specific regulatory and bank-level risk management variables are reported in subsections 7.2.1 to 7.10 to test hypotheses one to six.

Overall, six hypotheses are tested in this chapter as follows:

- H_1 : The size of the bank is not related to bank stability in Ghana.
- H_2 : The level of external and interbank borrowing of the bank is not related to bank stability in Ghana.
- H_3 : The level of non-performing loans is higher for the bank with a lower level of bank stability in Ghana.
- H_4 : The level of regulatory risk governance practices of the bank is positively related to bank stability in Ghana.

H_5 : The state or the central bank ownership of the bank is not related to bank stability in Ghana.

H_6 : The level of foreign participation or origin of the bank is not related to bank stability in Ghana.

7.3.0 TEST OF PANEL REGRESSION ASSUMPTIONS

Following Battaglia and Gallo (2015) the panel data analysis is used as the most efficient tool because of the way the research data is structured. The panel data structure allows us to take into account the unobservable and constant heterogeneity, that is, the specific features of each bank (management style and quality, market perception, business strategy, etc.).

There are several different linear models for panel data. The fundamental distinction is that between fixed effects and random effects models. The primary estimation method is generalised least squares (GLS) random effects (RE) technique. This is because the random effects technique transforms data to get rid of autocorrelation in errors. This technique is therefore robust to first-order autoregressive disturbances (if any) even within unbalanced-panels and cross-sectional correlation and/or heteroskedasticity across panels (Battaglia and Gallo 2015).

In the presence of unobserved bank fixed effects, panel fixed effects (FE) estimation is commonly suggested (Wooldridge 2002). However, such FE estimation is not suitable for our study for two main reasons. First, time-invariant variables cannot be estimated with FE regression, as it would be absorbed or wiped out in 'within transformation' or 'time-demeaning' process of the variables

in FE. Thus, GLS RE is considered as an alternative to FE (Battaglia and Gallo 2015). The choice of the GLS RE model is also based on the results from the OLS diagnostic tests, which is summarised from Appendices 5.4 and 5.5. Table 7.1 below presents the summary of the diagnostic tests carried out in Appendices 5.4 and 5.5.

Table 7.1: Summary results of OLS and Panel Data Diagnostics

Diagnostics	Type of Test	Test Statistic			P-values		Implications
Normality	Swilk e	W			0.16089		Normally distributed
	Swilk r	W			0.16089		
Homoskedasticity	Breusch-Pagan (BP)/Cook-weisberg	χ^2			0.5911		Homoskedastic
		0.29					
Multicollinearity	Mean Variance Inflation Factor(VIF)	VIF			1.47		No multicollinearity
Autocorrelation	Breusch-Godfrey	Lag (1)	10.512	0.0012		Presence of autocorrelation	
		Lag (6)	39.44	0.0000			
Model Specification	Linktest	_hat			0.381		No specification error
		_hatsq			0.135		
	Ovtest	F	2.3	0.1157		No specification error	
Choice of Model	Breusch-Pagan	7.3			0.0034		FE/ RE and not Pooled OLS
	Hausman	3.14			0.7915		GLS Random Effects
Robust GMM Model Specification	Hansen J Test	Sig.	$\chi^2(1)$	J Test	Model 2 P-values		The GMM Model is valid and is properly specified
		1%	6.635	1.0919	3	0.2960	
		5%	5.025	1.1215	2	0.2896	
		10%	2.706	2.4308	1	0.1187	
Source: STATA 12							

Table 7.1 shows that there is the possibility of autocorrelation in the data. This is followed by the results obtained from the Breusch–Pagan, Hausman and Hansen’s J tests shown in Appendix 5.5.

7.4 PANEL RESULTS

The results of the various estimation methods used are presented in Tables 7.2 and 7.3. Table 7.2 reports the pooled OLS, fixed effects model and random effects model on the empirical model specified in section 5.11. Table 7.3 applies the GMM estimator to the model to test the robustness of the GLS random effects model results. They show the full sample regressions in which we include all the regressors. A positive co-efficient indicates an increase in bank stability and a negative one indicates a reduction in bank stability. In general the results from the GLS random effects model and the GMM are very similar.

Following Beck et al. (2013), as the dependent variable is the natural logarithm of the Z-score, the point estimate can be interpreted as a semi-elasticity. In all, bank size and all the regulatory risk variables, namely, risk governance, regulatory independence and origin appear to be statistically significant. Again following Beck et al. (2013), the absolute values of the coefficients of the significant variables are as follows: bank size coefficient varies between 0.082 (FE) to 0.199 (GMM robust); risk governance coefficient varies between 0.072 (pooled OLS) to 0.085 (GMM hac-bartlett); regulatory independence coefficient varies between 0.32 (GMM robust) to 0.394 (FE); and origin coefficient varies between 0.557 (FE) to 0.710 (pooled OLS).

A noteworthy first result from all the two tables is that we do not find much evidence of the significance of the other two bank-level risk variables, the interbank borrowing and NPL. The absolute values of their coefficients are as follows: interbank borrowing coefficient varies between 0.0075 (pooled OLS) and GMM (robust) to 0.0087 (GMM hac-bartlett); and NPL coefficient varies between 0.0016 (FE) to 0.0044 (GMM hac- Bartlett and hac –bartlett Newey West).

Two results are especially worth pointing out. First, we find a consistent and significant direct influence of size, risk governance, regulatory independence and origin. The second is that the constant remains significant in all the estimation methods used.

Table 7.2: Determinants of Bank Stability: Model 1

	(1)	(2)	(3)
Dependent Variable	Z-score	Z-score	Z-score
Estimation Technique	Pooled OLS	Fixed Effects (FE)	GLS Random Effects(RE)
Bank –level variables			
Size	-0.1877***	-0.0827	-0.1556**
	(0.002)	(0.457)	(0.030)
Interbor	-0.0086*	-0.0075	-0.0076
	(0.073)	(0.183)	(0.116)
Nplrat	-0.0039	-0.0016	-0.0030
	(0.339)	(0.804)	(0.553)
Regulatory variables			
Risgov	0.0725*	0.0822*	0.0845**
	(0.094)	(0.094)	(0.040)
Reind	-0.3936***	-0.3949*	-0.3741**
	(0.002)	(0.074)	(0.012)
Origin	0.7100***	0.5573 *	0.6686***
	(0.000)	(0.054)	(0.000)
Constant	5.9467***	3.8100*	5.2463***
	(0.000)	(0.084)	(0.000)
R-squared within		0.1368	0.1290
R-squared	0.3515		
Adjusted R-squared	0.3096		
<p>Notes: The dependent variable is the Z-score which is the combination of risk adjusted average return on assets ($ROAA/\sigma_{ROAA}$) and leverage risk ($(Assets/Equity)/\sigma_{ROAA}$). Bank-level control variables are: Size(Bank Size) is the natural log of total assets of a bank; Interbor(Bank Interbank borrowing and debt) is the ratio of total interbank borrowing and debt to total liabilities of a bank in per cent; Nplrat(Non-performing loans) is total non-performing loans to Total Gross Loans of a bank in per cent. The regulatory-level control variables are: Risgov(Risk Governance) which takes a scale of 1-4. 4 represents the highest and 1 the least score; Reind (Regulatory Independence) is a dummy variable, taking the value of 1 if the bank is a private bank and 0 otherwise; Origin (Bank Origin) which is a dummy variable, taking the value of 1 if the bank is foreign and 0 if the bank is local; P values are in parenthesis; * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level. Coefficients are on top of parenthesis.</p>			
Software Used: STATA 12.0.			

Table 7.3: Determinants of Bank Stability: Model 2 Robust Test

	(1)	(2)	(3)
Dependent Variable	Z-score	Z-score	Z-score
Estimation Technique	GMM (Robust)	GMM (HAC-Bartlett)	GMM (HAC-Bartlett Newey West)
Bank –level variables			
Size	-0.1993***	-0.1946***	-0.1947***
	(0.000)	(0.003)	(0.003)
Interborr	-0.0075	-0.0087	-0.0086
	(0.122)	(0.179)	(0.178)
Nplrat	-0.0041	0.0044	0.0044
	(0.466)	(0.479)	(0.478)
Regulatory variables			
Risgov	0.0802**	0.0851**	0.0848**
	(0.028)	(0.012)	(0.014)
Reind	-0.3235***	-0.3411**	-0.3394**
	(0.006)	(0.026)	(0.024)
Origin	0.6120***	0.6307***	0.6296***
	(0.000)	(0.000)	(0.000)
Constant	6.1638***	6.0840***	6.0857***
	(0.000)	(0.000)	(0.000)
Hansen's J	0.118	0.2896	0.2960
<p>Notes: The dependent variable is the Z-score which is the combination of risk adjusted average return on assets ($ROAA/\sigma_{ROAA}$) and leverage risk ($Assets/Equity/\sigma_{ROAA}$). Bank-level control variables are: Size(Bank Size) is the natural log of total assets of a bank; Interborr(Bank Interbank borrowing and debt) is the ratio of total interbank borrowing and debt to total liabilities of a bank in per cent; Nplrat(Non-performing loans) is the ratio of total non-performing loans to Total Gross Loans times of a bank in per cent . The regulatory-level control variables are: Risgov(Risk Governance) which takes a scale of 1-4. 4 represents the highest and 1 the least score; Reind (Regulatory Independence) which is a dummy variable, taking the value of 1 if the bank is a private bank and 0 otherwise; and Origin (Bank Origin) which is a dummy variable, taking the value of 1 if the bank is foreign and 0 if the bank is local. Instrumentals for equation include foreign ownership, local ownership, the constant, size, interbank borrowing, non-performing loans, risk governance and regulatory independence. HAC standard errors based on Bartlett kernel with 20 lags by Newey –West method; HAC standard errors based on Bartlett kernel with 98 lags. P values are in parenthesis; * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level. Coefficients are on top of parenthesis. Software Used: STATA 12.0.</p>			

Regarding the estimation method, we employed two commonly used estimators that have been used before in the bank stability literature by Brei and Schclarek (2013): the fixed or random effects panel estimator and the GMM estimator. The choice to work with random-effects rather than with the fixed effects version is based on the Hausman test which rejects that the coefficients are significantly different.

Given our static panel data specification, a further robust test is undertaken by using the linear GMM estimator based on the panel GMM estimator formalised by Hansen (1982). The Hansen test, tests the null hypothesis that the model is valid and the J-statistic is asymptotically chi-squared with $K - L$ degrees of freedom, where K is the number of moment conditions, and L is the number of estimated parameters. Again the J statistic is not significant even at 1% significance level, so we conclude that our model is valid and not mis-specified (Hayashi 2000).

The Breusch–Pagan, tests the null hypothesis that the individual (or time) specific variance components are zero. This was rejected to conclude that there is significant random effect in the panel data and that the random effects model is able to deal with heterogeneity better than the pooled OLS (Park 2011). The LM follows the chi-square distribution with one degree of freedom. The Breusch –Pagan (BP) chi-square statistic for model (1) is 7.31 (p-value is 0.0034) as shown in Table 7.1.

The Hausman test is further used to examine if the individual effects are significantly correlated with any of the regressors (Park 2011). The Hausman

tests in this study for the model (1) follow the chi-square distribution of six degrees of freedom. The Hausman test statistic for model (1) is 3.14 (and the p-value is 0.79). These results suggest that we cannot reject the null hypothesis that the coefficients are the same. In other words, the results show that the individual effects are, in most cases, not significantly correlated with the explanatory variables, so that random effects model can be used to model bank level specificities.

7.5.0 FINDINGS AND DISCUSSIONS: BANK SIZE AND BANK STABILITY

This section examines the effect of bank size on bank stability and its implications. Based on the results from Table 7.4 below, bank size was found to have a statistically significant and a negative relationship with the Z-score at the 1%, 5% and 10% levels using the GMM and pooled OLS estimation methods.

Table 7.4: Bank –level risk: Size results

Bank – level risk taking variable	Dependent Variable : Z–Score					
	Pooled OLS	Fixed- Effects(FE)	GLS Random - Effects(RM)	GMM (Robust)	GMM (HAC Bartlett)	GMM (HAC Newey- West)
Size	-0.1877*** (0.002)	-0.0827 (0.457)	-0.1556** (0.030)	-0.1993*** (0.000)	-0.1946*** (0.003)	-0.1947*** (0.003)
*, **,*** indicates significance at the 10%, 5%, 1% levels. The p-values are in the parenthesis. Source: STATA 12 and Tables 7.2 and 7.3						

The relationship is statistically significant at the 5% and 10% levels using the GLS random effects model. It is not statistically significant using the fixed

effects model but maintains a negative relationship. Thus the evidence supports a negative relationship between bank stability and the size of the bank in Ghana. We therefore have sufficient evidence to reject the hypothesis (H1), which states that, the size of the bank is not related to bank stability in Ghana.

7.5.2 DISCUSSIONS

The study finds that that increases in bank assets in Ghana reduced stability levels. The findings support the empirical studies by Demirgüç-Kunt and Huizinga (2011) who found a negative relationship between size (absolute size) and Z-score using a sample of international banks from 1991 to 2009. Their findings suggested that bank growth has not been in the interest of shareholders in smaller countries. Laeven et al. (2014) also found that larger banks are riskier and create more systemic risk, when they have lower capital and less stable funding. This is particularly so with the large state-owned and small Ghanaian private banks that have a lower capital base relative to their assets as presented in Table 6.6 coupled with their high loans to deposit ratios also shown in Figure 6.7 by CAL, HFC, UT, ADB and NIB. They tend to share many of the risk factors that the too-big-to-fail hypothesis (Farhi and Tirole 2012) and unstable banking hypothesis (Gennaioli et al. 2013) have identified as being drivers of systematic risks, such as high leverage, activity diversity, and interconnectedness.

As shown in Figure 4.1 (the conceptual framework) in chapter 4, the negative relationship is in conflict with expectations that come with increased financial inclusion in a developing country like Ghana, because it is expected to promote

economic growth and development. However, the structure and quality of the assets created theoretically and practically determine their relationship with bank stability.

In the Ghanaian context, the increases in assets of banks are in bank infrastructure and loans. Over the period of study competition has increased, making yield on new and expanding branches very low, even though overall profits have generally been increasing in nominal terms. The second is the continued influence of government on state-owned banks to create long term assets through the financing of strategic imports such as petroleum for some state enterprises and special agricultural loans with negotiated rates with the central bank. These transactions contribute significantly to overall reduction in the return on assets (ROA).

7.5.3 IMPLICATIONS

The too-big-to-fail (TBTF) argument means that state owned banks should be supported with fresh capital injections from the state budget. Alternatively these state banks should be allowed to float part of their shares on Ghana Stock Exchange(GSE) as part of their capital expansion programmes whilst maintaining state control for strategic reasons. The same should apply to the private banks (Casu et al. 2015).

As suggested by Demirgüç-Kunt and Huizinga (2013), the state-owned banks should be made to downsize given the huge size of public debt and also as a fiscally constrained country as discussed in chapter 2, in order for the state-owned banks to be able to rely on the implicit financial safety net in future.

The second is the need to develop E-money payment platform which has a high adoption, conversion and penetration rate than the cards and cheque payment system because of their convenience, accessibility and security. This will improve the economies expected from the rate of branch and infrastructure expansion to improve stability which is unique to the African region. This also means that new regulation should be made on E-money payment which will bring the activities of telecommunication firms under Bank of Ghana's control (Muthiora 2015).

7.6.0 FINDINGS AND DISCUSSIONS: INTERBANK BORROWING AND BANK STABILITY

This section examines the effect of interbank borrowing and debt on bank stability and its implications. Table 7.5 presents the results across the estimation methods and show a negative relationship between bank borrowing and bank stability.

The relationship between borrowing and debt and bank stability is significant under pooled OLS model at the 10% level. Except for the pooled OLS, there is no significant relationship using the other estimation methods at the 1%, 5% and 10% levels.

Table 7.5: Bank –level risk: Interbank borrowing and Debt results

Bank – level risk taking variable	Dependent Variable Z –Score					
	Pooled OLS	Fixed Effects(FE)	GLS Random Effects(RM)	GMM (Robust)	GMM (HAC Bartlett)	GMM (HAC Newey- West)
Interbank borrowing and debt	-0.0086* (0.073)	-0.0075 (0.183)	-0.0076 (0.116)	-0.0075 (0.122)	-0.0087 (0.179)	-0.0086 (0.178)
*, **, *** indicates significance at the 10%, 5%, 1% levels. The p values are in the parenthesis. Source: STATA 12 and Tables 7.2 and 7.3.						

Table 7.5 therefore shows that, there is no sufficient evidence to reject the hypothesis (H2) that the level of external and interbank borrowing of the bank is not related to bank stability in Ghana.

This negative relationship supports the theory of capital structure and its application to banks by Inoguchi (2013). Empirically, the findings support the work of Anginer and Demirgüç-Kunt (2014) as discussed in Chapters 4 that interbank borrowing and debts in foreign currencies in volatile economies reduce banking stability.

7.6.1 DISCUSSIONS

Within the financial stability theory and supervisory standard mentioned in Figure 4.1, is a rapidly developing financial stability literature that borrows from the theory of networks which stresses the importance of borrowing on bank stability. Increases in interbank borrowing indicate funding fragility. The sign of

the coefficients (albeit not significant) is in line with recent empirical studies on the financial stability. Gauthier et al. (2012) found that bank stability correlates negatively with interbank market activities in Canada. Earlier findings by the Bank of England (2009), Arnold et al. (2012), and the World Bank (2014) suggested that interconnectedness, leverage and maturity transformation were the three main aspects of financial vulnerability.

A bank's borrowing might also include borrowing denominated in a foreign currency. A negative relationship between bank borrowing and bank stability suggests that the cost of borrowing is outweighing benefits. And, foreign exchange instabilities inherent in the foreign denominated borrowing can reduce earnings and have increased volatility in the banks' earnings.

Foreign banks, therefore, have a greater incentive to rely more on local interbank borrowing, which by convention in Ghana are guaranteed by holdings of government bills (BOG 2000). However, increasing government bills holdings, and the competitive rates on them, provide the incentives to intensify the use of interbank borrowing further. This situation potentially from empirical studies lead to long term stability risks of increased velocity of collateral, collateral mining (Singh 2011) and reverse maturity transformation (Singh and Stella 2012) , as symptoms of banking sector instability.

7.6.2 IMPLICATIONS

These findings have many implications. Referring to Figure 4.1, the findings call for limits on foreign debt holdings of local banks and proper approach to the country's capital account management by the central bank becomes very

crucial. Ocampo et al. (2008), argue that if a country does not increase reserves when the domestic firms increase short term foreign currency borrowing, it faces a greater risk of crisis. This means that Ghana can self-insure itself against future capital account crisis if it increases its reserves as foreign denominated short term liabilities increase. Having a well sequenced and Preventive Capital Account Regulations as a developing country are, therefore, needed to ensure stability of the banking system (IMF 2015b).

7.7.0 FINDINGS AND DISCUSSIONS: NPL AND BANK STABILITY

Hypothesis H3 is about the relationship between the level of non-performing loans of the banks and bank stability. The results in Table 7.6 show a negative relationship between bank stability and non-performing loans.

Table 7.6: Bank –level risk: NPL results

Bank – level risk taking variable	Dependent Variable Z –Score					
	Pooled OLS	Fixed Effects(FE)	GLS Random Effects(RM)	GMM (Robust)	GMM (HAC Bartlett)	GMM (HAC Newey- West)
Nplrat	-0.0039 (0.339)	-0.0016 (0.804)	-0.0030 (0.553)	-0.0041 (0.466)	-0.0044 (0.479)	-0.0044 (0.478)
*, **, *** indicates significance at the 10%, 5%, 1% levels. The p values are in the parenthesis. Nplrat is Non-performing Loans rate. Source: STATA 12 and Tables 7.2 and 7.3.						

There is no sufficient evidence to accept the null hypothesis (H_3). The results are weak as none of the coefficients in all the models estimated is statistically significant at the 1%, 5% and 10% levels. The results show that non-performing

loans issue is a bank-wide and a serious regulatory challenge because they represent an ex post credit risk (Louzis et al. 2012) and a deteriorating balance sheet of banks (Ghosh 2015) and therefore require a more careful attention across board.

7.7.1 DISCUSSIONS

The negative non-performing loans coefficient is consistent with the expected view in banking literature that non-performing loans lead to diminution of bank asset values and increase the volatility of bank earnings, and hence reducing stability (Foos et al. 2010; Ghosh 2015). The results show that banks identified as having high stability scores could potentially have had some high level of non-performing loans in Ghana. The results also support the findings in chapter 6, section 6.4.2, where the differences between the NPL levels of foreign and local banks were found not to be significant.

The risk is the possibility of overestimation of profits and therefore the Z-scores. The possible underestimation of NPLs is caused by the variations in the reporting of non-performing loans which practically still exist. The variations in the degree of reporting of NPLs represent the depth of operational and conduct risk failures in the entire asset portfolio risk management of Ghanaian banks as non-performing assets are potentially misclassified as current by the local banks to shore up their assets (IMF 2011). The IMF study in 2011 noted a variety of practices that result in an overstatement of capital, profitability, and liquidity in the banking sector and these practices persist. These include: (i) the misclassification of non-performing loans, particularly those linked to

government arrears; (ii) under-provisioning for NPLs; (iii) the treatment of restructured loans as current; (iv) accrual of interest on NPLs; and (v) the reporting of encumbered treasury securities among liquid assets. Though improving to 12.0 per cent as at the end of 2013, misclassification and under-provisioning for loans are still common occurrences among banks. Adjustments to 2012 figures by the IMF team for some of the obvious misclassifications, and lending to shareholders, showed that some of the small and medium sized banks may be undercapitalised (IMF 2013a).

7.7.2 IMPLICATIONS

As discussed in chapter 6, section 6.10.1 and following the lead from the literature, notably Zhang (2016), it can be argued that the capital injections into the banking system allowed the banks to write off non-performing loans and caused a significant fall of NPLs during the period 2012 and 2013. If this is the case, then the findings provide support for bad management, skimping and moral hazard hypotheses (Berger and DeYoung 1997). Therefore two additional policy implications can be suggested.

First, the government of Ghana should strengthen the loan trusts it has set up, to effectively help sanitise the loan books of the state-owned banks to complement the needed capital injections.

Second, the Bank of Ghana should subject the market and interest rate risks associated with the loans to comprehensive regulatory requirements or to strong asset and liability management frameworks as they currently do not exist (IMF 2013a). This is because the characteristics of the banks' loan default

structure show that, Ghanaian banks are assuming counterparty credit risks beyond the perceived credit worthiness of their borrowers.

7.8.0 FINDINGS AND DISCUSSIONS: RISK GOVERNANCE IN BANKS AND BANK STABILITY

Hypothesis H4 assesses the relationship between the level of risk governance practices of the bank and bank stability. The results presented in Table 7.7 show that compliance with expected governance levels and other specific requirements, such as existence of Chief Risk Officer (CRO), use of value at risk (VaR) and other risk-related corporate governance mechanisms, positively affected banking system stability in the study period. In other words, the results from Table 7.7 show that bank stability is positively and significantly affected by the risk governance practices of banks in Ghana. The two estimation models, the random effects and the GMM model, report that the relationship is statistically significant at the 5% and 10% levels.

Table 7.7: Bank Regulatory Risk: Risk Governance results

Bank Regulatory variable	Dependent Variable Z –Score					
	Pooled OLS	Fixed - Effects(FE)	GLS Random- Effects(RM)	GMM (Robust)	GMM (HAC Bartlett)	GMM (HAC Newey- West)
Risgov	0.0725* (0.094)	0.0822* (0.094)	0.0845** (0.040)	0.0802** (0.028)	-0.0851** (0.012)	-0.0848** (0.014)
*, **, *** indicates significance at the 10%, 5%, 1% levels. The p values are in the parenthesis. Risgov is Regulatory governance. Source: STATA 12 and Tables 7.2 and 7.3.						

The pooled OLS and fixed effects estimation models also report a significant relationship at the 10% level. None of the coefficients is statistically significant at the 1% level. The results provide sufficient evidence to accept the hypothesis that the level of risk governance practices of the bank is positively related to bank stability in Ghana.

7.8.1 DISCUSSIONS

A positive coefficient on risk governance implies that an increased recognition and implementation of a high degree of enterprise-wide risk management system by boards and bank-level managers will enhance bank stability. This also implies that, unsound governance practices of banks would reduce bank stability. The finding of a positive relationship between risk governance and banks stability is consistent with Aebi et al. (2012) who investigated the relationship between corporate governance, enterprise risk management (ERM) and bank performance. They concluded that banks with Chief Risk Officers (CROs) reporting to the board had significantly less negative ROEs during the financial crisis. Increases in ROEs have a positive impact on the Z-score through the CAR. In Ghana, most of the international banks began to comply with risk governance rules after 2009. The local banks followed suit in 2011, by complying fully with IFRS 7 which required disclosure of risk management policies and measures in published financial statements. Given the importance of risk governance on bank stability, there is the need to deepen the risk management culture in Ghanaian banks.

7.8.2 IMPLICATIONS

If the improvement in risk governance structures can lead to improvements in bank stability, then the regulatory authorities should promote the development of a risk management culture among the banks in keeping with BCP 7 (the risk management process).

Ghanaian banks have to adopt an enterprise-wide and integrated approach to risk management by increasing the size of their risk committees with persons with the abilities to balance business growth with bank risk management (Battaglia and Gallo 2015).

Complementary and integral activities such as risk assessment, risk monitoring and risk mitigation require further investments in systems and staff development. These investments would lead to the minimisation of compliance costs, optimisation of markets, credit and operational risk profiling and stability improvement. The regulator is also required to adopt risk-based supervisory approach in line with Basel II/III to reinforce the efforts of the banks.

7.9.0 FINDINGS AND DISCUSSIONS: REGULATORY INDEPENDENCE AND STABILITY

Hypothesis H5 examines the relationship between the level of regulatory independence of banks and bank stability in Ghana. Table 7.8 below shows a negative and statistically significant relationship between regulatory independence and bank stability at the 1%, 5% and 10% levels, when the pooled OLS and GMM robust estimation models are used.

The GLS random effects and GMM (Bartlett and HAC) estimation methods show that the relationship is statistically significant at the 5% and 10% levels. The fixed effects results show that the relationship is significant at the 10% level.

Table 7.8: Bank Regulatory Risk: Regulatory Independence results

Bank Regulatory variable	Dependent Variable Z –Score					
	Pooled OLS	Fixed Effects(FE)	GLS Random Effects(RM)	GMM (Robust)	GMM (HAC Bartlett)	GMM (HAC Newey- West)
Reind	-0.3936*** (0.002)	-0.3949* (0.074)	-0.3741** (0.012)	-0.3235*** (0.006)	-0.3411** (0.026)	-0.3394** (0.024)
*, **, *** indicates significance at the 10%, 5%, 1% levels. The p values are in the parenthesis. Reind is Regulatory Independence. Source: STATA 12 and Tables 7.2 and 7.3.						

The results suggest that there is sufficient evidence to reject the hypothesis (H_5) that the state or the regulator ownership of the bank is not related to bank stability in Ghana.

7.9.1 DISCUSSIONS

The study shows that continued government and the regulator's direct participation in commercial banking activities contribute to the reduction in bank stability in Ghana. Theoretically, the findings support or reflect Andrianova et al. (2008) locational model of banking, that distinguishes between private and public banks and find that the role played by state-owned banks depends on the institutional quality of a given country. Empirically, the findings therefore

support findings of Cull and Martinez Peria (2013) and Iannotta et al. (2013) who argued that increased government and regulatory participation in bank governance lead to reduction in bank stability due to their persuasion of political goals. Barth et al. (2008) findings suggest that policies that induce incentives for private sector corporate control of banks, among other things, work best to promote banking sector stability.

7.9.2 IMPLICATIONS

First, there is the need to refocus the importance of government holding and influence over state-owned banks. Various schools have argued in support or against state ownership. Theoretical models by protagonists including Andries and Bullion (2010) suggest that state capital and strong state financing machinery are needed due to the structural nature of the Ghanaian economy. However, the results from this study show that it is not just the injection of capital, but the quality of the management team appointed by the government to these banks equally matters. Board appointments should be based on competence and the regulatory fitness tests have to be revised and redefined with emphasis on risk-based management skills.

Again, the Bank of Ghana's holdings in ADB and NIB need to be partly privatised or sold to a strategic partner with a focus on development banking only, or universal but development banking focused. This will require a strategic investor with a huge capital and expertise in project financing, which is the key to unlock wealth and capital for sustainable growth in developing countries like Ghana (Finnerty 2013).

7.10 FINDINGS AND DISCUSSIONS: FOREIGN PARTICIPATION OR OWNERSHIP AND STABILITY

Table 7.9 reports the relationship between foreign ownership and banking stability in Ghana. The pooled OLS, the GLS random effects model and the GMM estimation method show that all the coefficients are statistically significant at the 1%, 5% and 10% levels. The fixed effects method of estimation however shows that the relationship is significant at the 10% level.

Table 7.9: Bank Regulatory Risk: Foreign Participation/Ownership results

Bank Regulatory variable	Dependent Variable Z –Score					
	Pooled OLS	Fixed Effects (FE)	GLS Random Effects(RM)	GMM (Robust)	GMM (HAC Bartlett)	GMM (HAC Newey- West)
Origin	0.7100*** (0.000)	0.5573* (0.054)	0.6686*** (0.000)	0.6120*** (0.000)	0.6307*** (0.000)	0.6296*** (0.000)
*, **, *** indicates significance at the 10%, 5%, 1% levels. The p values are in the parenthesis. Origin is Foreign Ownership/ Origin. Source: STATA 12 and Tables 7.2 and 7.3.						

Based on the results, we have sufficient evidence to reject hypothesis *H6*, that the level of foreign participation or ownership of the bank is not related to bank stability in Ghana and can conclude that the participation of foreign banks impacts positively to the stability of Ghana's banking sector.

7.10.1 DISCUSSIONS

The results support the global advantage hypothesis which stresses that foreign banks have advantages over domestic banks. The home field advantage

hypothesis has seen less success in Ghana due to limited capital and slow adoption of technologies which Ghanaian consumers prefer such as electronic payment products using the mobile phone technologies. The results of this study support the prior findings by Cleassens and Van Horen (2012) on the effect of foreign entry into banking sector and their positive impact on banking system stability. The preponderance of the foreign banks in the highly stable and stable category in Chapter 6 also confirms the findings of Vogel and Winkler (2011) report that foreign banks in emerging economies including sub-Saharan Africa, contribute more than the local banks, albeit depending on the maturity of the banking sector.

7.10.2 IMPLICATIONS

The dominance of foreign banks in determining the stability of the banking sectors has many implications for banking sector regulatory design, notably in areas relating to banking safety, bank resolution, cross-border regulation and management of macro-prudential challenges. These implications are explained below.

Whilst the parent banks of the foreign banks provide insurance for their home depositors, the same does not apply to Ghanaian depositors. This observable weakness in the regulatory design and structure should be remedied. The design of any deposit insurance scheme in Ghana therefore, should reflect the level of financial depth else it will spur financial services growth only in the short term. Bernet and Walter (2009) differentiate four separate types of deposit insurance schemes on the basis of their roles and powers. The four are the pay

box; cost reducer; resolution facilitator and supervisor models. Stability objective requires that any deposit insurance in Ghana should have a resolution status to correct the existing safety gap. It should also capture the dynamics of the industry with respect to foreign acquisition of licensed banks and the attendant cross-border deposit insurance issues. Subject to the growth in the capital market, the deposit insurance scheme to be instituted could be transformed to a supervisory role.

The next important issue relates to the financing of the scheme. State warranty imposes additional budgetary burden. The contribution of capital by insured institutions has the serious limitation of not having adequate contribution against a pending exposure. Security based financing is inapplicable given the underdeveloped bond market in Ghana. The preferred option for Ghana is to adopt a deposit insurance scheme that prepares the system proactively and is flexible to adjust to future claims or pay-outs. This means that a combined ex-ante and ex-post financing model would be the most appropriate but requires an effective setting of premiums (Casu et al. 2015).

Fundamental to the scheme should be the adoption of risk-based premiums based on the level of non-performing loans, measured by the current regulatory standards or the Z-score which accommodates the requirements of IFRS 9. Premiums will also signal the market about the quality of individual bank-level risk management. The scheme has to ensure that the fund's assets are invested on a risk-free basis and can be liquidated. Pay-out decisions have to be framed to distinguish between eligible and covered deposits, which protect small depositors and SMEs which dominate the Ghanaian banking customer

base. Furthermore, the architecture of the deposit insurance scheme should not only enforce explicit warranty in the reform of reinsurance, but it should support cross-border harmonisation and co-operation. Such reinsurance or explicit warranty should cover details of the role of the state, terms of the warranty, warranty-triggering events, restricted or unrestricted warranty, anticipatory credit or warranty payments, pay-out mechanisms and compensation (Bernet and Walter 2009).

The influx of foreign banks also requires that the banking system is prepared to accommodate any possible failure should it occur. This suggests that an efficient Ghanaian special resolution system should be built on five pillars of: speed and transparency; law for co-operation (domestically and internationally); timely recognition of a looming illiquidity or insolvency; timely initiation of preventive measures to secure existing assets and liquidity; and timely shutdown or recapitalisation of insolvent financial institutions (Financial Stability Board 2011).

Again, given the dominance of foreign banks, reciprocal arrangements will be beneficial to contain possible cross-border arbitrage coming from the use of cross-border sources of bank financing. This necessitates the sharing of information across national supervisors through supervisory colleges (Enoch et al. 2015). Specifically, the regulator should have the structures and systems to identify developments in, and migration of activity to the fringe of the regulated sector. Developing systemic, timely and accurate data on these fringes should also be a priority. Therefore, macro-prudential policies should be designed to be intrusive (IMF-FSB-BIS 2016).

A summary of all hypotheses and results of the models are presented in Table 7.10 below.

Table 7.10: SUMMARY OF ALL HYPOTHESES AND MODEL RESULTS

Variables	Hypothesis	Expected sign of the relationship	Empirical Results/effect on bank stability or soundness	Conclusion
H1: Bank size	The size of the bank is not related to bank stability in Ghana.	Positive (+) or Negative (-)	Negative(-) and statistically significant	Reject Hypothesis
H2: Interbank Borrowing	The level of external and interbank borrowing of the bank is not related to bank stability in Ghana.	Positive (+) or Negative (-)	Negative(-) and not statistically significant	Accept Hypothesis
H3: Non-Performing Loans	The level of non-performing loans is higher for the bank with a lower level of bank stability in Ghana.	Negative (-)	Negative(-) and not statistically significant	Reject Hypothesis
H4: Risk governance	The level of regulatory risk governance practices of the bank is positively related to bank stability in Ghana.	Positive (+)	Positive(+) and statistically significant	Accept Hypothesis
H5: Regulatory Independence	The state or the central bank ownership of the bank is not related to bank stability in Ghana.	Positive (+) or Negative(-)	Negative(-) and statistically significant	Reject Hypothesis
H6: Foreign participation or Ownership	The level of foreign participation or ownership of the bank is not related to bank stability in Ghana.	Positive (+) or Negative(-)	Positive(+) and statistically significant	Reject Hypothesis

Source: Constructed from the Summary of Hypotheses Table 4.7 and Panel Results in Tables 7.2 and 7.3.

7.11.0 BLINDER-OAXACA DECOMPOSITION

One of the main conclusions in Chapter 6 was that foreign banks in Ghana on average had a higher level of stability than the local banks. However, the differences in their factor endowments and how their interaction with each other given their stability levels cannot be discerned from the preferred GLS random-effects model and the GMM results discussed in sections 7.1 to 7.10. To answer these challenging issues, the Blinder-Oaxaca decomposition is used, and the findings are discussed below.

Oaxaca first estimates two group-specific regression models, and then performs the decomposition. Tables 7.10 -7.12 report further the interaction effects of bank stability and their characteristics using the independent variables decomposed by their origin either as foreign or local.

The decomposition output reports the mean predictions by local and foreign banks and their differences in Tables 7.11 and 7.12 below. The decomposition results in Table 7.11 suggest that the mean of the log of Z-score (stability measure) is 2.43 for foreign banks and 1.99 for local banks, yielding a stability gap of 0.44. In the second panel of the decomposition, the output, the stability gap is divided into three. The first part reflects the mean increase of 0.10 in the stability of local banks if they had the same characteristics or predictor levels as the foreign banks. The increase of 0.10 indicates the endowment (brands, strategies, global presence) effect. The second term quantifies the change in local bank stability score if local banks had foreign banks' coefficients which will lead to a decrease of 0.0095 in the stability score which is very small in effect.

The third part is the interaction term that measures the simultaneous effect of differences in endowment and coefficients which is 0.35. The overall effect is the measured stability gap of 0.44 between foreign and local banks. Therefore foreign banks coefficient of 2.43 is largely explained by their endowments and coefficients.

Table 7.11 Blinder-Oaxaca Decomposition of Z-score by origin (local)

Blinder-Oaxaca Decomposition						
Number of observations =100						
1: local =0						
2: local = 1						
Z –score	Coef.	Std. Err.	Z	p> z	[95% conf. Interval]	
Differential						
Prediction _1	2.4347	0.0710	34.27	0.000	2.2954	2.5739
Prediction_2	1.9902	0.0619	32.14	0.000	1.8688	2.1115
Difference	0.4445	0.0942	4.72	0.000	0.2597	0.6292
Decomposition						
Endowments	0.1030	0.1056	0.98	0.329	-0.1040	0.3101
Coefficients	-0.0095	0.2027	-0.05	0.963	-0.4069	0.3878
Interaction	0.3509	0.2232	1.57	0.116	-0.0865	0.7884

Software used: STATA 12.0

The results in Table 7.12 show the relative contribution of the local and foreign banks to banking system stability by retransforming the logarithmic scales to the original scales. The (geometric) means of Z-scores are 11.41 for foreign banks and 7.31 for local banks, which amounts to a difference of 56 %. This means that, adjusting local bank endowment levels to the levels of the foreign banks would increase local banks stability by 56 %. This supports the importance of

foreign banks in contributing to the current levels of banking sector stability in Ghana.

Table 7.12 Exponentiated Results

Blinder-Oaxaca Decomposition						
Number of observations =100						
Oaxaca, eform						
1: local =0						
2: local = 1						
Z –score	Exp(b)	Robust Std. Err.	Z	p> z 	[95% conf. Interval]	
Differential						
Prediction _1	11.4127	0.7822	35.92	0.000	9.9780	13.0536
Prediction_2	7.3171	0.4306	33.82	0.000	6.5199	8.2118
Difference	1.5597	0.1409	4.92	0.000	1.3066	1.8618
Decomposition						
Explained	1.5678	0.3689	1.91	0.056	0.9882	2.4865
Unexplained	0.9949	0.2477	-0.02	0.984	0.6106	1.6210

Software used: STATA12.0

Finally the decomposition of the Z-score into leverage and portfolio risk allowed for the analysis of the extent to which leverage risks interact with the independent variables in the study. Table 7.13 below, shows a stability gap of 0.41 between the foreign and local banks, which is close to the overall gap of 0.44. The conclusion is that the gap in overall stability means is largely attributed to leverage risk differences, indicating the size of a bank's capital is a key measure of its level of stability.

**Table 7.13 Blinder-Oaxaca Decomposition of Leverage Risk by origin
(local)**

Blinder-Oaxaca Decomposition						
Number of observations =100						
1: local =0						
2: local = 1						
Leverage Risk	Coef.	Std. Err.	Z	p> z	[95% conf. Interval]	
Differential						
Prediction _1	2.2430	0.0836	26.81	0.000	2.0790	2.4070
Prediction_2	1.8231	0.0551	33.05	0.000	1.7199	1.9312
Difference	0.4199	0.1002	4.19	0.000	0.2303	0.6164
Decomposition						
Endowments	0.0905	0.0932	0.97	0.331	-0.0920	0.2732
Coefficients	-0.1700	0.2180	-0.78	0.436	-0.5973	0.2573
Interaction	0.4993	0.2356	2.21	0.034	0.0374	0.9613

Software used: STATA 12.0

7.12 CRITICAL REVIEW OF OAXACA DECOMPOSITION RESULTS

Since our analysis is based on a limited number of years from 2009 to 2013, our results should be viewed as applying to the short run. If and when foreign banks and domestic banks converge as regards their structure and behaviour (endowments), the differences as observed by us would gradually disappear. Convergence may mean two possibilities. Either the foreign banks reduce their endowment and coefficients effects while that of the local banks remain or increase or the local banks increase their endowment and coefficient effects faster to eliminate the difference. It should be noted that if for example the endowments become equal, the differences will become zero, and the

interaction effect will also become zero. The appropriate option given the results obtained from Tables 7.11 and 7.12 is that, the local banks will have to improve their endowments in order to enhance their stability levels.

However, to the extent that the main difference between foreign banks and domestic banks is that the former are integrated in a multinational bank holding, whereas the latter are stand-alone entities, our results may actually be more long-lasting (De Hass and Van Lelyveld 2006). Again the assumption has been that groups are homogenous and therefore ignores variations in individual bank's approach to improve its endowment resources.

If the endowment differences may be long-lasting, it is imperative for the managers of local and state-owned banks to refocus their attention on the primary characteristics of the foreign banks which make customers perceive them as strong brands, including introduction of efficient technologies in mobile money payment platforms, adaptation to current global risk management practices, staff development, branch services to counter cheque cloning among others.

Again local banks should invest in their accounting and risk management systems, show to the financial market that their financial statements presented and disclosed are of the highest quality. This will in the short to medium term support the stability of the banks by attracting cheap deposits and easy access to capital (Ratnovski 2013).

7.13 CRITICAL ASSESSMENT OF THE USE OF CAMELS RATING AND Z-SCORES IN PREDICTING BANKING STABILITY IN GHANA AND THEIR LIMITATIONS

It is important to note that the CAMELS is an early warning system (EWS) designed to draw regulators attention to certain key variables that show the risk profile and soundness of individual financial institutions in Ghana.

Generally, the CAMELS results are not made public, except in an event of a bank's failure (Casu et al. 2015). It is seen largely as a micro-prudential tool. The additional limitation is that it becomes static (Casu et al. 2015) when there is room for management discretion on the timing of data and information generation especially where reports are not tied to managers' jobs or do not put shareholders profits at risk (Shehzad and De Haan 2015). Again some qualitative elements have to be introduced in the computation of the CAMELS ratings (Bassett et al. 2015).

That is why in recent times the IMF and the Ghanaian regulator have been complementing the CAMELS framework with the use of stress testing as an additional supervisory tool (IMF 2013a,b). The long term aim is to embed stress testing in bank risk management practices rather than it simply being a regulatory tool. Primarily, stress testing is designed to complement the Basel capital ratios by adding more forward-looking perspective and by helping to ensure that banks will have enough capital to keep lending even under highly adverse circumstances (Casu et al.2015).

Stress tests raise a number of issues including problems with data collection, the use of different methodologies and the need to reconcile internal expert judgement and external benchmarks as well as national and international

regulatory requirements in a developing country like Ghana where regulatory capacity is limited (Fuch et al. 2013). From banks' point of view, stress testing can be expensive and time consuming exercise. Banks criticise both the methodologies and data used (Casu et al. 2015). From the macro-prudential angle, the Financial Stress Index is currently non-existent in Ghana because market-based variables are a limitation (Vermeulen et al. 2015).

The Z-score on the other hand reflects the extent to which a bank's profit and capital levels can withstand the volatile profitability (Casu et al. 2015). It suffers largely from its reliance on the availability of high quality accounting data that the banks provide for its estimation. The quality of accounting data is also determined by the appropriateness of the current accounting standards (IFRSs and IASs) being used or adopted, the audit regime and the regularity of information generated.

The possibility of developing a forward Z-score also reduces the critique by Casu et al.(2015) that the Z-score like all accounting measures has the limitation of being static and backward-looking at a point in time and the evidence that managers have exercised their timing discretion to minimise regulatory costs.

In the area of banking stability, Casu et al.(2015:558) show that, the Z-score can be calculated for the whole banking system (macro-prudential) by simply calculating the Z-score for individual banks(micro-prudential) and then calculating the weighted average by bank size(usually assets). These measures allow the Z-score to be used for micro-prudential and macro-prudential purposes.

Following Lepetit and Strobel (2015), who assessed the forecasting performance of the Z-score by using the co-efficient of variation of the root mean squared error (CVRMSE) which evaluates the relative closeness of the predictions to the actual values in their work, similar tests were carried out in this study on the pooled OLS model, fixed effects model and the random effects model. As shown in Appendix 5.5, the pooled OLS had a CVRMSE of 18.99; fixed effects model had a CVRMSE of 16.86; and random effects model had a CVRMSE of 16.66. It is observed that the co-efficient of variation of the RMSE of the random effects model is consistently the least among the three models when the Z-score is used as the dependent variable.

Therefore the stability results predicted by the Z-score using the random effects on banking stability are close to their actual values. The p-values also tell us whether a variable has statistically significant predictive capacity in the presence of other variables, that is, whether it adds something to the equation.

However caution should be exercised here because a variable that does not have a predictive power in the presence of other predictors may have predictive capability when some of these predictors are removed from the model.

In sum because both stability measures are accounting based and given the critique offered above, such evidence suggest the need for further analyses of earnings management and accounting rules on bank riskiness (Chiaramonte et al. 2015) if they are to be used effectively in Ghana. The next chapter will focus on the research contribution and its conclusions.

CHAPTER 8

CONTRIBUTION, LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

8.1.0 INTRODUCTION

This chapter discusses the conclusions of the thesis. It seeks to achieve three main objectives. First it summarises the key research findings. Second, the contribution to research, management practice and policy in banking will be identified. In this regard some policy suggestions and their limitations if they are to be implemented in Ghana are further discussed. Third, the research limitations and avenues for future research will also be identified.

8.2.0 KEY RESEARCH FINDINGS

The results of this study show that the use of the CAMELS and the Z-score measures could lead to different outcomes in terms of bank stability in Ghana. This suggests that the traditional micro-prudential CAMELS framework should be complemented with the Z-score which inherently has both micro and macro-prudential characteristics of signaling weaknesses in bank stability, and to enhance the management of bank stability in Ghana.

The study also examined the impact of some bank-specific variables on bank stability. The results show that while bank size, regulatory governance, regulatory independence and origin impact significantly on the stability score, there was no significant impact in terms of interbank borrowing and non-performing loans. Further analysis using the Blinder –Oaxaca decomposition

also suggests that foreign banks in Ghana exhibit relatively higher levels of stability compared to local banks.

The policy implications of these findings suggest that the liberalisation of the banking sector should be accompanied by an effective micro- and macro-prudential supervisory regime in order to manage the stability of the constituent banks and the banking sector as a whole.

8.3.0 CONTRIBUTION TO LITERATURE

This research contributes to the literature in many ways. It contributes to a strand of literature which compares the use of accounting-based measures as against market-based measures in assessing the stability and regulation of banks. This thesis therefore complements the recent work by Chiaramonte et al. (2015) and Lepetit and Strobel (2015) although a different methodology has been adopted and the granularity of data is different in comparing the CAMELS and the Z-score. It contributes also to the strand of literature in banking which stresses on the role of accounting in banking stability. The research is based on the assumption that the accounting data used is reliable. Therefore the findings from the research contribute to the strand of literature which focuses on the usefulness of accounting data for analysing banking performance and their regulation starting with Schwartz et al.(2014), Bushman (2014) and Acharya and Ryan(2015).

Again, the Blinder-Oaxaca decomposition has been widely used in the social science literature, to explain differences in outcomes for different groups, and its

application in the banking and finance literature is limited. This study therefore makes a methodological contribution to the strand of literature which uses the Blinder-Oaxaca decomposition to provide insight into banking sector risk and regulation as recently carried out by Bassett et al.(2015) in the USA banking context. Therefore this research is one of the pioneers to apply the Blinder-Oaxaca methods to explain the stability gap between foreign banks and local banks in Ghana.

This is one of the first major work that examines the stability of Ghanaian commercial banks over the period 2009 to 2013. It fills the gap in the extant literature by comparing the CAMELS and Z-score and provides insights into the varying levels of banking stability from pre-capitalisation period of 2009 to 2011 and post capitalisation period from 2012 to 2013 in Ghana. It provides the first direct evidence of the relationship between bank-level and regulatory variables and banking stability measure, the Z-score in the context of pre and post capitalisation periods in Ghana. The study therefore contributes to knowledge by advancing incrementally the understanding of the level of stability of Ghanaian banks, and adds some revelatory information in the form of the effects of bank-level risk factors and regulatory variables on stability of Ghanaian banks.

Again, the period of study makes this thesis contribute to post-crisis literature on banking stability in sub-Saharan Africa. In other words, the study is also timely given the recent reforms in the banking industry in Ghana and their potential impact on bank stability. Although, there are a number of studies on banks in

Ghana, the other studies focus largely on competition and efficiency and do not cover the issues addressed in this study.

It complements the strand of literature that examines the impact that foreign banks have on the banking sector stability of the host country especially in developing countries starting with Claessens and Van Horen (2012) , Lee and Hsieh (2014) and Moyo et al. (2014). Again the Z-score indexation is an extension to the use of Z-score in the literature. Empirically, the use of the leverage ratio in this research to assess the stability of Ghanaian banks reflects the use of FDIC's risk-adjusted leverage ratio indexation in the Ghanaian context.

8.4.0 CONTRIBUTION TO MANAGEMENT PRACTICE

The main contribution of this research to bank management practice is that the fragility of banks might go unnoticed because the Bank of Ghana currently relies on the CAMELS as the regulatory tool. It is observed from this study that, banks that might be classified as sound using the CAMELS could be classified otherwise if the Z-score is used as the bank stability measure. The regulator can, therefore, use the Z-score as a complementary measure for assessing the stability of Ghanaian banks as shown in current literature on bank stability (Casu et al. 2015).

Therefore in the area of asset and liability management practice, this thesis provides further insight into what managers of banks should consider as an integral part of any high-level design of their portfolio planning, budgeting and provisioning strategies. The research draws managers of banks attention to the

fact that in their management practices, activities should be seen from their impact on the bank's balance sheet first. The Z-score index suggests that management should always take into account, how the assets they create impact on the bank's stability rating. This is because the assets will not be risk weighted, as it uses benchmarks set by the deposit insurers, it will be critical to depositors who monitor their banks. It therefore contributes to factors that a manager of a bank's liability side of its balance sheet should consider to ensure the growth of the bank's potential and market share.

This research contributes to bank management practice by raising the issue of 'profit mining' in the banking sector which may go unnoticed if regulators in Ghana and in many sub-Saharan Africa continue to pursue the current policy of frequent increases in banks nominal capital (nominal capital regulation) without considering their effects on investor attitudes and interest. The thesis suggests as an implication that, it promotes moral hazard which potentially follows from the 'profit mining' incentive induced by such measures in practice. This situation also reflects some of the regulatory dialectic (Casu et al. 2015) in the Ghanaian context that the research has brought to light.

8.5.0 CONTRIBUTION TO REGULATORY POLICY

The research makes contribution to policy from three angles: the micro-prudential, macro-prudential and regulatory architecture. In the area of micro-prudential policy the contributions are related to entry policy, safety and resolution. For regulatory practice, the research suggests that the regulator should revisit the bank licensing regime to differentiate bank licences by activity

and capital requirements. Conscious efforts should then be made to attract strategic import and export development financing institutions.

The research assesses its contribution to macro-prudential by taking the lead from the literature and by using the framework suggested by the IMF-FSB-BIS(2016) on the definition, objectives and scope of macro-prudential policy. The research contributes to macro-prudential policy by having identified the too-big-to –fail phenomena in the Ghanaian banking sector. This is means the regulator should control such structural vulnerabilities within the Ghanaian banking sector that arise through the linkages and common exposures through the growing loan syndication structures. The critical role of the state banks which renders them too-big-to-fail is defined by their share of banking liabilities which is over 20% (BOG 2015). This means that they need to be recapitalised, through more equity injections, deleveraging by sticking to the standard loan – deposit ratios and reduce their level of borrowing but deepen their deposit mobilisation efforts with the unbanked and the under-banked due to their physical spread. The option to merge them will worsen the situation while asking them to reduce lending will also reduce their current procyclical role given the structure of the economy (Brei and Schclarek 2013). The objective is to prevent unrestraint leverage, debt stocks and volatile funding. Again the interbank market should be regulated and its growth controlled by defining which assets can be taken to collateralise all transactions.

The effectiveness of these measures requires that there are regulatory rearrangements within the current regulatory design or architecture. The aim is to ensure that the potential systemic risks posed by local and foreign banks are

controlled to achieve the expected level of bank stability. The choice between the preferred twin-peak and an integrated regulatory structure would strategically reposition the Ghanaian regulator to potentially perform its expected role as the market maker of last resort (Nier 2009; Oganessian 2014).

The adoption of an integrated approach to regulation may be saddled with the problems of regulatory information gathering gaps and legal powers due to the structure being less integrated and holistic in dealing with systemic risks (Daniels and Thornton 2013) which need to be minimised in Ghana. The twin-peak approach on the other hand combines centralisation with regulation by objective, and splits the regulatory functions between two regulators: one that performs the safety and soundness supervision function and the other that focuses on the conduct-of-business regulation.

8.6.0 LIMITATIONS AND CHALLENGES OF THE STUDY

The major limitation of the study is the relatively small number of observations, which restricted the extent to which the analysis could be done. Another challenge had been the availability and integrity of data as many post –balance sheet adjustments were detected in some cases two years after the publication of the financial statements. Such challenges required a continuous review of accounting data presented and used in this research.

The number of banks that could meet the minimum qualifying criteria defined as any licensed bank for 5 years with a fully audited financial statement also reduced the number of sample banks available for the research. Because some participating banks are not on the Ghanaian stock market, the

compromise between the limitations of manual collection and the need to have adequate data for the panel data analysis made it extremely labour-intensive. This also affected the number of observations for the panel study and hence the degrees of freedom for any complex estimations.

It would have been helpful to test directly the interaction effect between the bank variables and the regulatory indicator variables but this would increase the number of regressors, reducing the degrees of freedom of the model and the power of any inference tests.

Again the study does not take into account the possible impact of other financial market institutions such as savings and loans, rural banks, finance houses, cooperatives and credit unions operating in Ghana. In addition, is the large informal and unbanked segment which interacts with the banking sector directly and indirectly through the payment platform controlled by the Bank of Ghana. This situation has put a severe limit on interpretation of the research findings, such as those relating to non-performing assets due to the paucity of interlocking information between the formal banking sector and the large informal sector.

8.7.0 SUGGESTIONS FOR FUTURE RESEARCH

Financial stability is an emerging field in banking regulation and therefore there are potential prospects for future research. The research followed largely an exploratory path, but did retain a focus on central issues relating to the regulatory structures and bank –level risk taking and stability in Ghana. There are issues that arose during the research that were outside the scope of the

research and could not be explored within it. However, these issues open up some opportunities for future research.

The first recommendation for research is based on some of the limitations above. Future research can cover the entire banking sector that will include players in the Ghanaian financial services sector, notably the commercial banks, savings and loans and other deposit –taking firms. Alternatively, future research can focus on the relative stability of stakeholder value (STV) driven firms, notably the credit unions against commercial banks that have shareholder value (SHV) orientation. This is very important for banking regulation and governance research as the Bank of Ghana is attempting to regulate the credit unions and the telecommunication firms through the mobile money which is based on trust law.

The second recommendation relates to the research into the full impact of Basel II and III on the stability of banks in Ghana. Another area for future research is how the future application of dynamic provisioning on loans will impact on the stability levels of banks in Ghana. This is likely to affect the volatility of incomes and measurement of the stability scores.

Furthermore, the data can be extended to include banks from other West African countries to undertake a regional banking stability research. Again the Z-score, the CAMELS and other macroeconomic variables could be put together to create a financial stress index or a financial stability index to evaluate macro-prudential threats to banking stability in future research.

Finally, future research can look into the various regulatory rearrangements suggested in this research including the suggestion for the introduction of a deposit insurance scheme, the disciplinary role expected of the interbank market and assess their impact on stability of banks in Ghana.

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APPENDICES

Appendix 5.1: Sampling Procedure and Sample Size

Procedure Number	Process or Activity	Outcomes
1.	This table outlines the sample selection criteria and the number of banks considered in this study. The data for sample bank, country and industry level activities are sourced from the Ghana Stock Exchange (GSE), Published Annual Reports of Banks for distribution at Annual General Meetings (AGMs), IMF Financial Stability Reports in 2011, 2013 and 2014, Bank of Ghana Financial Stability Reports 2013, 2014 and 2015, and the Department of Banking Supervision (BSD) of Bank of Ghana Reports.	
2.	Initial Sample (list of licensed Class 1 Banks in Ghana) from Bank of Ghana sources	27
3.	Exclude banks with insufficient data on financial position and performance and main regression. Therefore, Bank of Africa, Bank of Baroda and Sahel Sahara Bank and Merchant Bank are excluded.	4
4	Sample after this step	23
5.	Exclude Banks having less than 5 continuous years of data. Therefore Energy Bank licensed in 2010, Royal Bank in 2012 and First Capital Plus Bank in 2013 are excluded.	3
6.	Final Sample	20

Appendix 5.2: Asset Categories and Risk Weights

Category	Definition	Risk-weight
Category 1	Cash funds, investment in government and Bank of Ghana securities, balances and deposits with well rated banks – Risk free	0%
Category 2	Placements with discount houses - Low Risk	20%
Category 3	Home mortgage loans – Modest Risk	50%
Category 4	All other assets, including customer loans, credit and receivables (other than home mortgage loans), fixed assets, current assets and deposits with poorly rated banks – Normal Risk	100%
Category 5	Off-balance sheet transactions, particularly those involving financial guarantees and other non-funded exposures – Normal Risk	100%

Appendix 5.3: The list of Participating or Sampled Banks

Number	Name of Licensed Bank	Ownership changes and control of Quasi-State institutions in determining regulatory independence				
		2009	2010	2011	2012	2013
1	Guaranty Trust Bank Ghana Limited(GT)	P	P	P	P	P
2	United Bank for Africa (UBA)	P	P	P	P	P
3	Standard Chartered Bank Ghana Limited	P	P	P	P	P
4	Barclays Bank of Ghana Limited	P	P	P	P	P
5	Ghana Commercial Bank Limited (GCB)	S	S	S	S	S
6	Access Bank Ghana Limited	P	P	P	P	P
7	CAL Bank Limited	S	S	S	S	S
8	Ecobank Ghana Limited	P	P	P	P	P
9	Stanbic Bank Ghana Limited	P	P	P	P	P
10	Zenith Bank (Ghana) Limited	P	P	P	P	P
11	SG	P	P	P	P	P
12	HFC Bank Limited	S	S	S	S	S
13	UT Bank Limited	P	P	P	P	P
14	Fidelity Bank Ghana Limited	S	S	S	S	S
15	Agricultural Development Bank Limited (ADB)	S	S	S	S	S
16	uniBank	P	P	P	P	P
17	First Atlantic Bank Limited(FABL)	P	P	P	P	P
18	Prudential Bank Limited	P	P	P	P	P
19	National Investment Bank Limited (NIB)	S	S	S	S	S
20	International Commercial Bank Limited (ICB)	P	P	P	P	P
Key	<p>P= Private Ownership having controlling interest</p> <p>S= Significant Government, Quasi –State and BOG Control or holding of over 20% share and/ as single majority shareholder.</p>					

Appendix 5.4

Diagnostic Analyses of OLS and Panel Data Assumptions (Annex to Chapter 7)

Table A presents OLS regression of the first model where the linear association of bank stability with bank-level risk management and regulatory variables are accounted for.

The first Pooled OLS Model		
OLS on Z-score		
Variable	OLS 1	
	Coefficient	P(values)
Size	-0.1877***	0.002
Interbank	-0.0086*`	0.073
NPL	-0.0039	0.339
Risk Governance	0.0725*	0.094
Regulatory Independence	-0.3936***	0.002
Origin	0.7100***	0.000
Constant	5.9467***	0.000
Number of Observations	100	
F(6, 93)	8.40	
Prob > F	0.0000	
R-squared (R²)	0.3515	
Adjusted R-squared	0.3096	
Legend : * p< 0.1; ** p< 0.05; *** p< 0.10		
Note: As indicated in the legend: * indicates significance at 10% level; ** indicates significance at 5% level; *** indicates significance at 1% level.		

The F tests of the OLS regression model indicate that the fit of the model as a whole is good, which shows that there might not be a problem of specification. However, from the very low R-squared statistic is 35% and the adjusted R-

squared is 30%. They indicate that a low part of the variation in Z-score is explained by the included independent variables in the model. This can be the first signal showing that OLS estimators might not be efficient and OLS cannot be the appropriate estimation method. Hence, in order to choose the appropriate estimation methods, we first make diagnostic analyses of the OLS assumptions so as to check whether the normally and independently distributed (NID) assumptions of OLS are met.

Normality of residuals

An assumption of the regression model (OLS) that impact the validity of all tests(p, t and F) is that residuals behave normal. Residuals (here indicated by the letter 'e') are the difference between the observed values(Y) and the predicted values (Yhat): $e=Y- Yhat$.

If residual do not follow a 'normal' pattern then we should check for omitted variables, model specification, linearity, functional forms. In sum, we may need to reassess our model/theory. Normality is problem when dealing with small samples.

A non-graphical test is the Shapiro-Wilk test for normality. It tests the hypothesis that the distribution is normal, in this case the null hypothesis is that the distribution of the residuals is normal.

The *numerical tests for normality* of the residuals by the Shapiro- Wilk W test for the null hypotheses of normal distribution yields the p-values is 0.16 and therefore we failed to reject the null hypotheses at 90%, 95% and 99%. We

conclude that the residuals are normally distributed. This indicates that we have to accept the null hypothesis, i.e., normality of residuals.

Table B: Test for Normality of Data

Shapiro-Wilk W test for normal data for Model 1					
Swilk e					
Variable	Observations	W	V	Z	Prob>z
e	100	0.98107	1.563	0.991	0.16089
Shapiro-Wilk W test for normal data for Model 1					
Swilk r					
Variable	Observations	W	V	Z	Prob>z
r	100	0.98107	1.563	0.991	0.16089
Source: STATA 12					

Homoskedasticity of Residuals

A non-graphical way to detect heteroskedasticity is the Breusch-Pagan/ Cook-Weisberg test. It tests the null hypothesis that the error covariance are all equal versus the alternative that the error variances are a multiplicative function of one or more variables.

For example, in the default `hatest` command shown below, the alternative hypothesis stated that the error variances increase (or decrease) as the predicted values of Y increase. That means the bigger the predicted value of Y, the bigger the covariance is. A large chi-square would indicate that

heteroskedasticity was present. In this example, the chi-square value was small, indicating heteroskedasticity was probably not a problem (at least that if it was a problem, it was not a multiplicative function of the predicted value).

In this test, if the chi-square obtained exceeds the critical chi-square value at the chosen level of significance, the conclusion is that there is heteroskedasticity. The chi-square is less than the critical at the chosen level of significance at 90%, 95% and 99%. This indicates that the residuals have a homogeneous variance. Hence, the numerical tests and the nature of panel data, the sounding judgment is that the residuals are homoskedastic. The implication is that if the variances were heteroskedastic, we may have the wrong estimates of the standard errors for the coefficients and therefore their t-values.

Table C: Breusch-Pagan/ Cook-Weisberg test for Heteroskedasticity

estat hettest	
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	
H0= Constant variance	
Variables: fitted value of Z-score	
Chi 2(1)	0.29
Prob > chi 2	0.5911
Source: STATA 12	

Multicollinearity

As a first step in checking for multicollinearity between the independent variables, Pearson's pair-wise correlation result is presented as in Table 6.3. It can be observed from the table that almost all of the correlations between pairs of the variables are less than 0.60, which shows that they have no problem of multicollinearity. In order to test for multicollinearity in the residuals,

assessment of the variance inflation factor (VIF) is made to check for the level of multicollinearity. The VIF, which leads us to the *tolerance* level of multicollinearity, $1/VIF$, of the model (*Table E*) shows a mean VIF of 1.47 (Models 1). A VIF greater than ($>$) 10 or $1/VIF$ less than 0.10 indicates a multicollinearity problem. Since the model has a VIF that is less than 10 and ($1/1.47$) is 0.68 and is far greater than 0.10, and it is more than 0.10. This shows that there is no multicollinearity problem.

Table D: Variance inflation factor, VIF, and tolerance using STATA12

Estat vif		
Model 1 and 2		
Variables	VIF	1/VIF
Size	1.20	0.832029
Interbank borrowing	1.08	0.922237
NPL	1.05	0.952962
Risk Governance	1.34	0.747306
Regulatory Independence	2.07	0.484102
Origin	2.07	0.482512
Mean VIF	1.47	
Source: STATA 12		

Independence of errors

In the panel data values that come from the same variable overtime and when there can be some form of homogeneity among the elements in a group, it is more likely that the errors of different observations can be correlated (autocorrelation of errors) with the adjacent time or group than those separated in time or in heterogeneity.

The Breusch-Godfrey LM test for autocorrelation is used due to its robustness.

Table E illustrates the results of the test.

Table E: Breusch – Godfrey LM Test for Autocorrelation

Lags(p)	Chi2	df	Prob. chi 2
1	10.512	1	0.0012
6	39.448	6	0.0000
Source: STATA 12			

The table shows that the probability a chi-square value as much as 10.512 or greater is only 0.0012. To achieve chi –square value of 39.448, must be extremely small or the actual p-value is almost zero. The result is that at least one of the six autocorrelations must be non-zero.

This implies that we need to find out if the autocorrelation is pure autocorrelation and not as a result of misspecification of the model. Again if it is pure autocorrelation one can use appropriate transformation of the original model so that in the transformed model, we do not have the problem of (pure) autocorrelation. Gujarati and Porter(2009), Battaglia and Gallo(2015) show that in the case of autocorrelation, one can make use of the generalised least squares (GLS) method.

Model specification test

The last diagnostic test on the model is to ensure whether the appropriate variables are included and/ or omitted from the model. This is important since, first, if one or more of the relevant variables are omitted, the common variance

they share with the rest in the model may be wrongly attributed to the included variables, and the error term is inflated, and second, if the irrelevant variables are included, the common variance they share with the rest in the model would wrongly be attributed to the irrelevant. The model specification problems or errors would affect the estimated regression coefficients substantially, and it is difficult to know the exact influence contributed by a predictor variable on the dependent variable.

One of the methods of detecting specification errors is by using the predicted values and the square of the predicted values and regress them on the dependent variable as predictors and check their significance.

The premise is that when the regression model is properly specified, there should not be any additional predictor variables that are significant. The post estimation *linktest* (Table F, Panel A) is therefore used to check whether we need more variables in our model by running a new regression with the observed Y (Z-score) and \hat{Y}^2 as independent variables. The thing to look for here is the significance of \hat{Y}^2 . The null hypothesis is that there is no specification error. If the p-value of \hat{Y}^2 is not significant then we fail to reject the null and conclude that our model is correctly specified.

Table F: Panel A: Linktest

Linktest Model 1						
Source	SS	df	MS	Number of obs. = 100		
Model	9.4621163	2	4.73105815	F(2, 97)	= 28.04	
Residual	16.3685744	97	0.168748189	Prob > F	=0.0000	
Total	26.926275	99	0.260916067	R-squared	=0.3663	
				Adj. R-squared	= 0.3532	
				Root MSE	= 0.41079	
Z-score	Coef.	Std. Err.	t	P> t	95% Conf. Interval	
_hat	-1.415615	1.608969	-0.88	0.381	-4.608972	1.777743
_hatsq	0.5306563	0.3521832	1.51	0.135	-0.1683299	1.229642
_cons	2.69996	1.818075	1.49	0.141	-0.908415	6.308335
Source: STATA 12						

Table F: Panel B: Ramsey Ovttest

estat ovtest
Ramsey RESET test using powers of the fitted values of zscore
H_0 : model has no omitted variables
F(3, 90) =2.03
Prob > F=0.1157
Source: STATA 12

The other specification test, called the Ramsey RESET test (Table F: Panel B), is another test for omitted variables. It creates new variables based on the predictors and refits the model using the new variables and test if any of them would be significant. In STATA, the **ovtest** command (a postestimation command) executes this test.

Testing for omitted variable bias is important for our model since it is related to the assumption that the error term and the independent variables in the model are not correlated ($E(e|X) = 0$). The null hypothesis is that the model does not have omitted variables bias, the p-value is higher than the usual thresholds of 0.01, 0.05 and 0.10 (90%, 95 % and 99% significance), so we fail to reject the null and conclude that we do not need more variables.

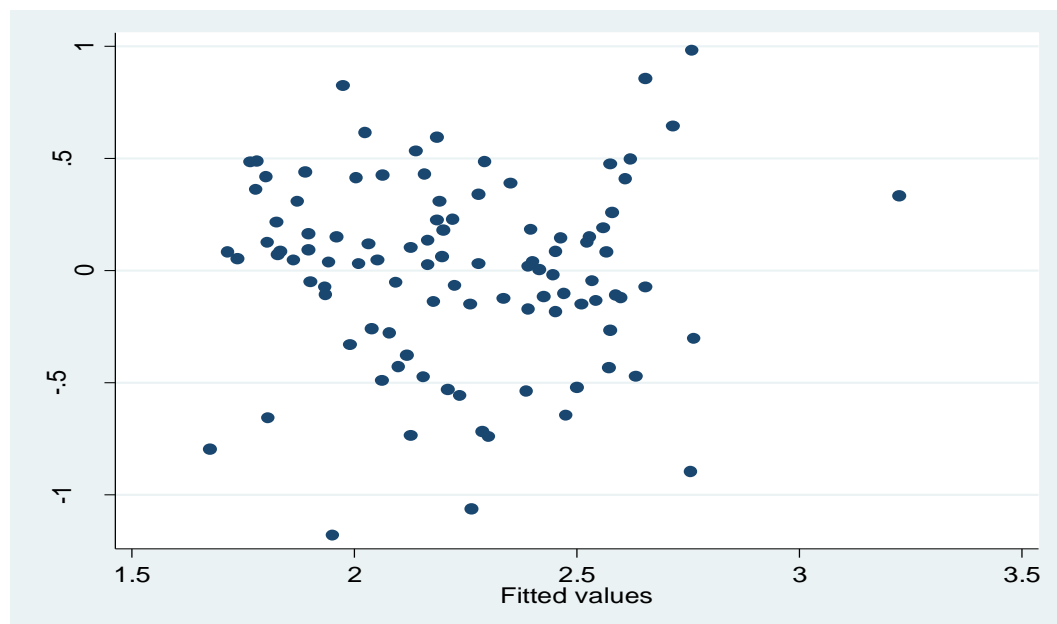
The test, as it can be seen below, shows that the F-test is not significant to reject the null hypothesis of no omitted variables. This indicates that there is no specification error, thus, omitted variables. This is what the R-squared statistics suggest. Adding more predictors into the model will not improve the R-squared.

Tests for Linearity

Here it must be noted that we have a multiple OLS regression where several independent variables are involved. In a panel data, linear relationship between the dependent and each of the independent variables; and between the dependent variable and the independent variables collectively were carried out. Hence, the check for linear relationship between the dependent variable and the independent variables cannot be straightforward. This check on individual independent variables shows that many of the variables show no clear departure from linearity. The plotting the standardized residuals against each predictor variable in the model to check for linearity between the predictors and the response variable show that they show some patterns of linearity as shown in Figures A and B. Figure C shows the partial regression plots (or added-variable plots) which plot the relationship between the Z-score and an

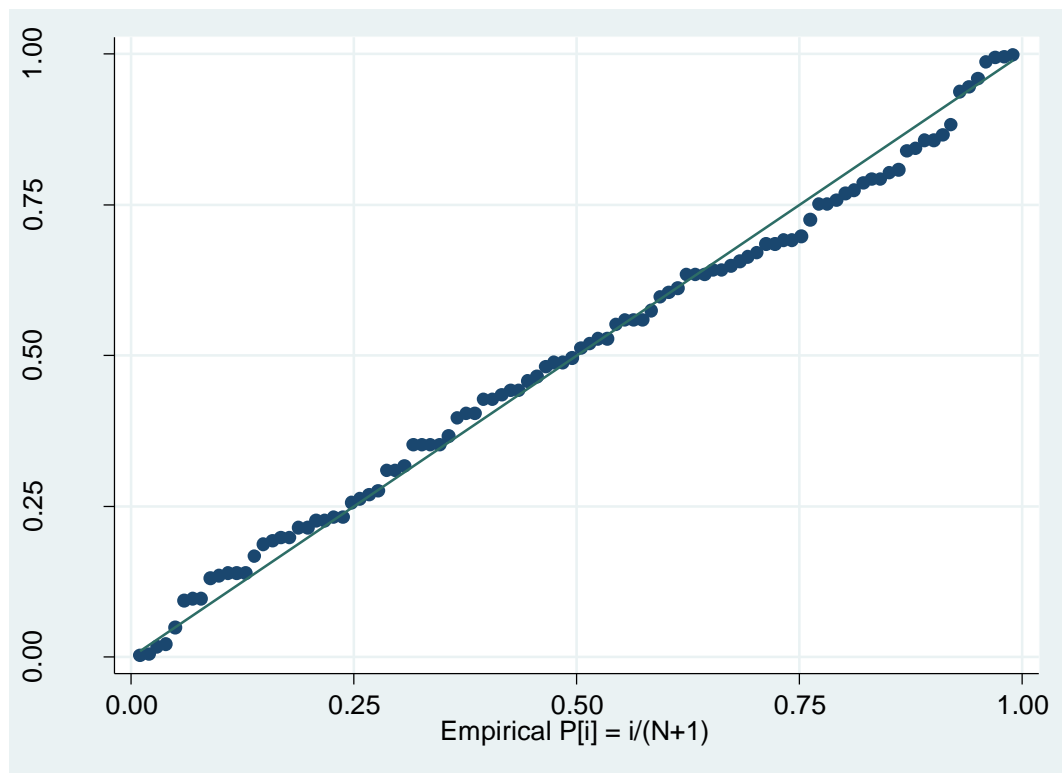
independent variable when the effect of other variables are removed and it is also good for diagnosing outliers. Figure D(i- vi) show the twoway scatter graphs with graphical assessment of linearity of the Z-score in predictors , with line and lowess fits. The lowess lines for size, interbank borrowing, risk governance, regulatory independence and origin look reasonably linear. That of the NPL also looks reasonably linear, albeit being pretty flat. The minor splitting gap at the beginning or at the end of the NPL line is not a big problem since there might be some influential observations that cause divergence. So, we conclude that linearity assumption is fulfilled. However, it is difficult to establish the linearity by using plots and there is also a room for non-linearity.

Figure A: Residuals –versus – fitted plots



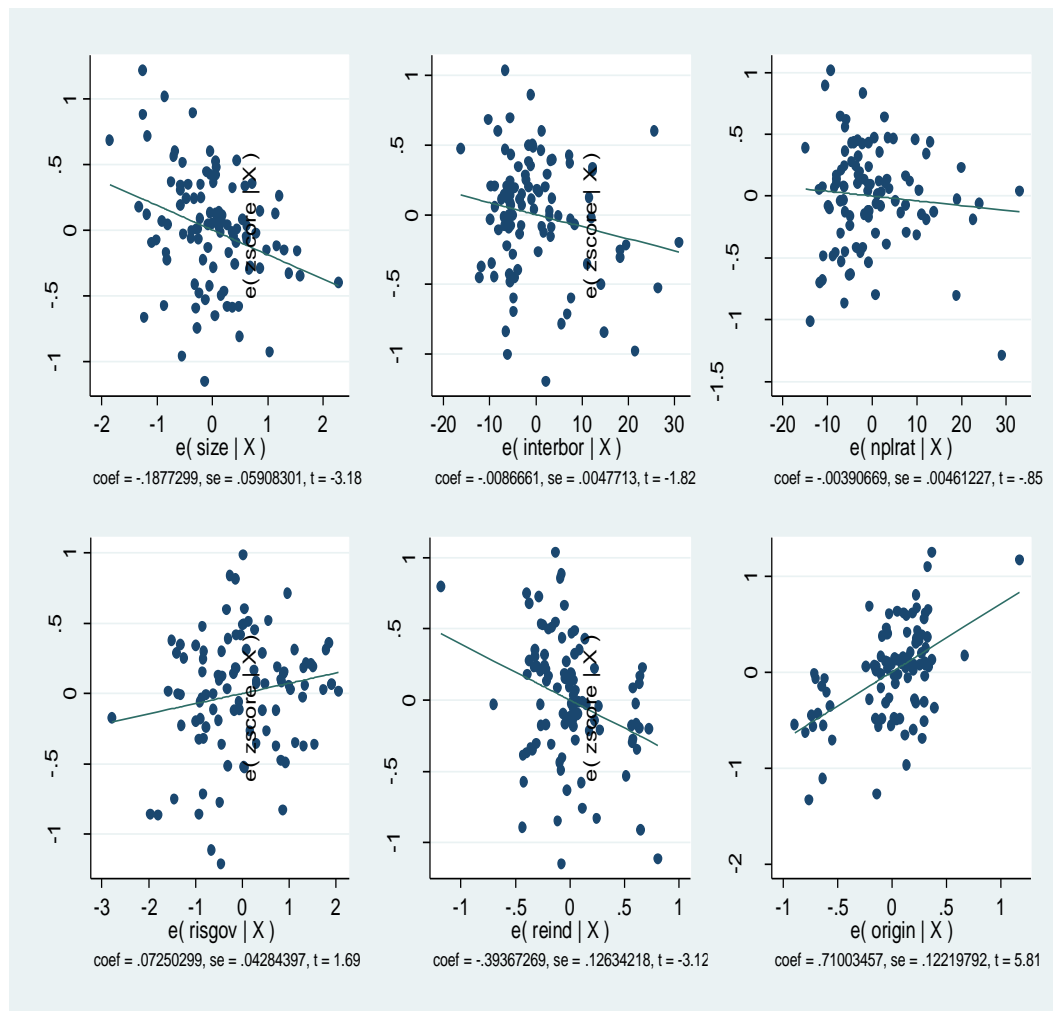
Source: Stata 12

Figure B: Z-score: Residuals(Close to normality)



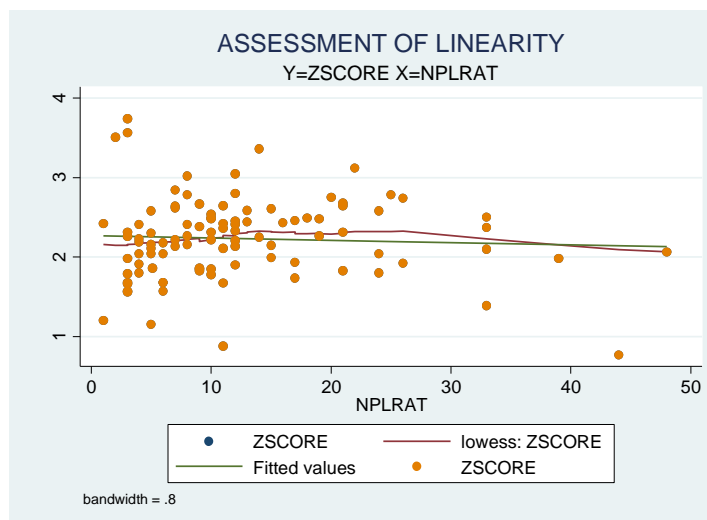
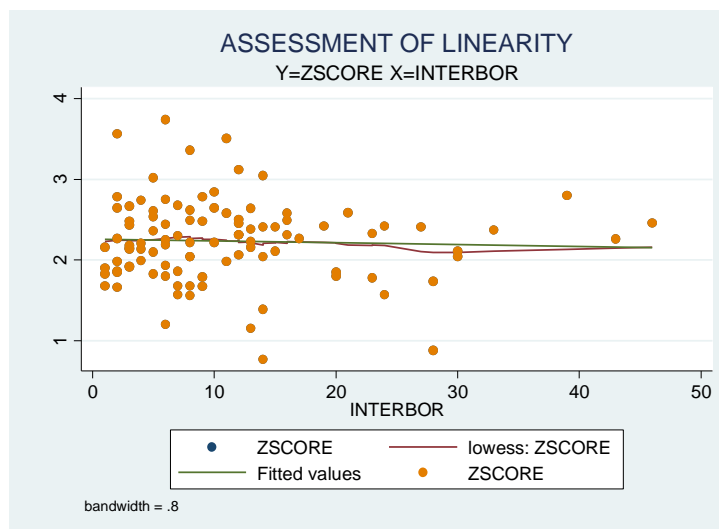
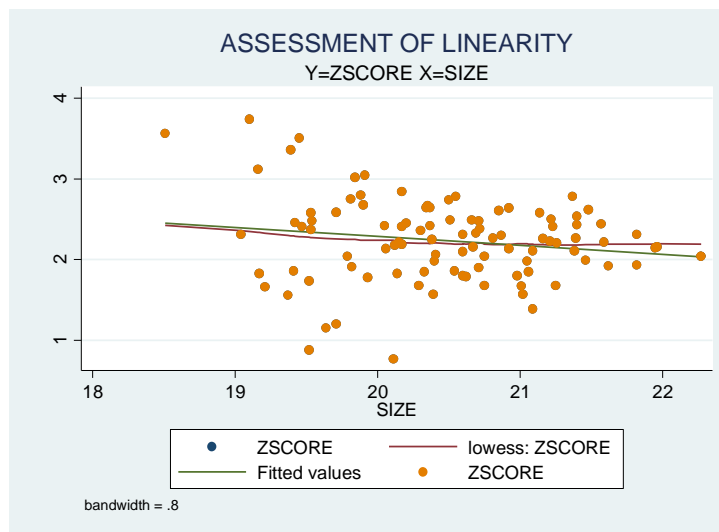
Source: Stata 12

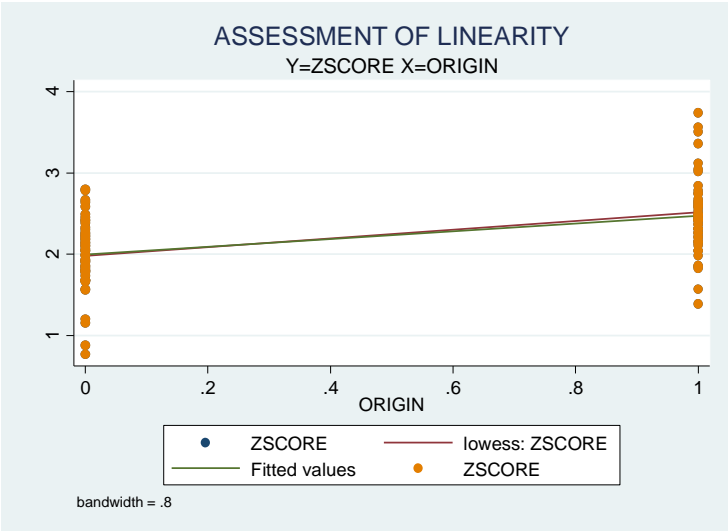
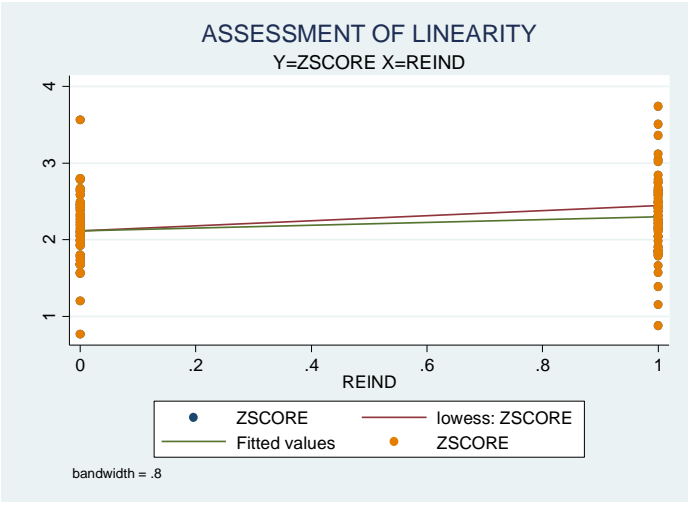
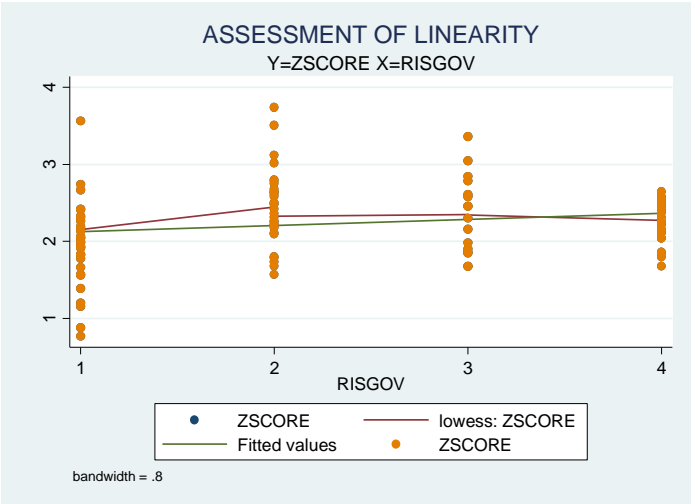
Figure C: Partial Regression Plot (avplots)



Source: Stata 12

Figure D(i-iv) :Assessment of Linearity





Source: STATA 12

APPENDIX 5.5: PANEL DATA DIAGNOSTICS AND PANEL RESULTS

To test for use of either the fixed effects or random effects model is appropriate, and against the violations to OLS conditions discussed in Appendix 5.4, the Breusch – Pagan and Hausman tests are presented in the Tables G and H below.

Breusch and Pagan Lagrangian multiplier test for random effects

$$Zscore [idno, t] = x_b + u[idno] + e[idno, t]$$

Table G: Estimated Results: Breusch - Pagan Tests

		Variable	Sd=sqrt(Var)
	zscore	0.2609196	0.5107994
	e	0.1419688	0.3767875
	u	0.0496507	0.02228243
Tests	Var(u) =0		
	Chibar 2(01)	7.31	
	Prob > chibar	0.0034	
Source: STATA 12			

The results from Table G show that fixed effects and random effects estimation techniques are preferred to pooled OLS estimation method. The choice between fixed effects and random effects is determined by using the Hausman test as shown in Table H. The results show that the random effects estimation is preferred to the fixed effects estimation because there are some panel effects which can be efficiently dealt with using the GLS random effects and the GMM estimation techniques.

TABLE H: Hausman Test (Fixed effects or fe)

Coefficients				
Variables	(b) fe	(B)	(b-B) Difference	Sqrt(diag(v_b- V_B)) S.E.
Size	-0.0827647	-0.1556267	0.728619	0.0843695
Interbor	-0.0075798	-0.0076185	0.0000387	0.0028731
Nplrat	-0.0016234	-0.0030257	0.00140023	0.0040525
Riskgov	0.0822781	0.0845132	-0.0022352	0.0257186
Reind	-0.394088	-0.374121	-0.0207878	0.1586511
Origin	0.5573168	0.6686556	-0.1113388	0.2399175
<p>. b = consistent under Ho and Ha; obtained from xtreg</p> <p>B= inconsistent under Ha, efficient under Ho; obtained from xtreg</p> <p>Test: Ho: difference in coefficient not systemic</p> <p>Chi2 (6) = (b- B) ' [(V_b – V_B^(-1))] (b- B)</p> <p>= 3.14</p> <p>Prob > chi2= 0.7915</p>				
Source: STATA 12				

TABLE I: ESTIMATION RESULTS AND FORECASTING PERFORMANCE

Pooled OLS						
Regress zscore size interborr nlprat riskgov reind origin						
Source	SS	df	MS		Number of Obs =100	
Model	9.0790023	6	1.51316705		F(6, 93)	=8.40
Residual	16.7516884	93	0.180125682		Prob > F	= 0. 0000
Total	25.8306907	99	0.260916067		R-squared	= 0.3515
					Adj R-squared	=0.3096
					Root MSE	= 0.42441
Z-Score	Coef.	Std. Err	t	p> t	[95% Conf. Interval]	
Size	-0.1877299	0.059083	-3.18	0.002	-0.305057	-0.0704028
Interbor	-0.0086661	0.0047713	-1.82	0.073	-0.018141	0.0008088
nlprat	-.00039067	0.046123	-0.85	0.399	-0.0130657	0.0052524
riskgov	0.072503	0.042844	1.69	0.094	-0.0125766	0.1575826
reind	-0.3936727	0.1263422	-3.12	0.002	-0.6445632	-0.1427822
origin	0.7100346	0.1221979	5.81	0.000	0.4673737	0.9526954
_cons	5.946702	1.1912	4.99	0.000	3.581251	8.312188
Forecasting Performance: Coefficient of Variation of the Root Mean Square (CVRMSE)						
Estimate: di 100* e(rmse)/ r(mean)						
= 18.991908						
Source: STATA 12						

Fixed Effects Model						
Xtreg zscore size interborr nlprat riskgov reind origin, fe						
Group variable : idno					Number of Obs =100	
R-sq:	within=	0.1368			Number of groups =20	
	between	0.4811			Obs per group	Min=5 Avg=5.0 Max=5
	overall	0.3137			F(6, 74) =1.96	
Corr(u_i, Xb)=0.1983					Prob > F =0.0831	
Z-Score	Coef.	Std. Err	t	p> t	[95% Conf. Interval]	
Size	-0.0827647	0.1106363	-0.75	0.457	-0.3032123	0.1376828
Interbor	-0.0075798	0.0056336	-1.35	0.183	-0.0188051	0.0036455
nlprat	-0.0016234	0.0065133	-0.25	0.804	-0.0146014	0.0113547
risgov	0.0822781	0.048526	1.70	0.094	-0.0144122	0.1789683
reind	-0.3949088	0.2176464	-1.81	0.074	-0.8285786	0.038761
origin	0.5573168	0.2848914	1.96	0.054	-0.0103418	1.124975
_cons	3.810011	2.178602	1.75	0.084	-0.5309479	8.15097
Sigma_u	0.28132736	(fraction of variance due to u_i)				
Sigma_e	0.37678754					
rho	0.35793803					
Forecasting Performance: Coefficient of Variation of the Root Mean Square (CVRMSE)						
Estimate: di 100* e(rmse)/ r(mean)						
= 16.860766						
Source: STATA 12						

Random Effects Model						
Xtreg zscore size interborr nlprat riskgov reind origin, re						
Random Effects GLS Regression Group variable : idno					Number of Obs =100	
R-sq:	within=	0.1290			Number of groups =20	
	Between=	0.5482			Obs per group	Min=5
						Avg=5.0
	Overall=	0.3476			Max=5	
Corr(u_i, X)=0 (assumed)					Wald chi2(6)= 30.55	
					Prob > F =0.0000	
Z-Score	Coef.	Std. Err.	z	p> t	[95% Conf. Interval]	
Size	-0.1556267	0.715693	-2.17	0.030	- 0.2959	-0.0153534
Interbor	-0.0076185	0.004846	-1.57	0.116	-0.0171164	0.0018795
nlprat	-0.0030257	0.0050991	-0.59	0.553	-0.0130196	0.0069683
riskgov	0.0845132	0.0411501	2.05	0.040	0.0038605	0.1651659
reind	-0.374121	0.1489954	-2.51	0.012	-0.6661476	0.0820944
origin	0.6686556	0.1536317	4.35	0.000	0.3675431	0.9697681
_cons	5.246363	1.428695	3.67	0.000	2.446172	8.046555
Sigma_u	0.22282428	(fraction of variance due to u_i)				
Sigma_e	0.37678754					
rho	0.25911068					
Forecasting Performance: Coefficient of Variation of the Root Mean Square (CVRMSE)						
Estimate: di 100* e(rmse)/ r(mean)						
= 16.667408						
Source: STATA 12						

The random effects model has a smaller coefficient of variation and therefore predicts values that are closer to the actual values.

ROBUSTNESS TESTS: GMM ESTIMATION RESULTS

Number of Moments=8						
Initial weight Matrix: Unadjusted						
GMM weight matrix: Robust				Number of Obs = 100		
	Coef.	Robust Std. Errors	z	p> z 	[95% Conf. Interval]	
Constant	6.163883	1.19595	5.15	0.000	3.819864	8.507903
Bank Size	-.1993271	.0563869	-3.53	0.000	-.3098435	-.0888108
Interbor	-.0075266	.0048648	-1.55	0.122	-.0170615	.0020083
nplrat	-.0041746	.0057314	-0.73	0.466	-.0154079	.0070587
Risgov	.0802107	.036487	2.20	0.028	.0086975	.151724
Reind	-.3235763	.1183429	-2.73	0.006	-.555524	-.0916285
Origin	.6120424	.1119499	5.47	0.000	.3926246	.8314603
Instruments for equation 1: forn local size interbor nplrat risgov reind _cons						
Estat overid						
Test of overidentifying restriction:						
Hansen's J Chi2(1) = 2.43408 (p=0.1187)						
Source: STATA 12						

GMM Estimation						
Number of parameters =7						
Number of Moments=8						
Initial weight Matrix: Unadjusted						
GMM weight matrix: HAC Bartlett 98				Number of Obs = 100		
	Coef.	Robust Std. Errors	z	p> z 	[95% Conf. Interval]	
Constant	6.084057	1.417121	4.29	0.000	3.30655	8.861563
Bank Size	-.1946026	.0660303	-2.95	0.003	-.3240197	-.0651856
Interbor	-.0087301	.0064926	-1.34	0.179	-.0214555	.0039952
nplrat	-.0044806	.0063358	-0.71	0.479	-.0168986	.0079373
Risgov	.0851716	.0340024	2.50	0.012	.0185281	.151815
Reind	-.341382	.1530599	-2.23	0.026	-.6411301	-.0411463
Origin	.6307298	.1374132	4.59	0.000	.3614049	.9000546
HAC standard errors based on Bartlett kernel with 98 lags						
Instruments for equation 1: forn local size interbor nplrat risgov reind _cons						
Estat overid						
Test of overidentifying restriction:						
Hansen's J Chi2(1) = 1.09195 (p = 0.2960)						
Source: STATA 12						

GMM Estimation						
Number of parameters =7						
Number of Moments=8						
Initial weight Matrix: Unadjusted						
GMM weight matrix: HAC Barlett 20 (lags chosen by Newey-West				Number of Obs = 100		
	Coef.	Robust Std. Errors	z	p> z 	[95% Conf. Interval]	
Constant	6.085701	1.414968	4.30	0.000	3.312414	8.858987
Bank Size	-.1947722	.0659677	-2.95	0.003	-.3240666	-.0654779
Interborr	-.0086386	.0064131	-1.35	0.178	-.0212081	.0039308
nplrat	-.004449	.0062728	-0.71	0.478	-.0167434	.0078454
Risgov	.084811	.0345422	2.46	0.014	.0171095	.1525126
Regind	-.3394553	.1506939	-2.25	0.024	-.63481	-.0441006
Origin	.6296771	.1361913	4.62	0.000	.362747	.8966071
HAC standard errors based on Bartlett kernel with 20 lags.						
Instruments for equation 1: forn local size interbor nplrat risgov reind _cons						
Estat overid						
Test of overidentifying restriction:						
Hansen's J Chi2(1) = 1.1215 (p=0.2896)						
Source: STATA 12						